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INSTALLATION RESTORATION PR

GULFPORT FIELD TRAINING SITE
MISSISSIPPI AIR NATIONAL GUARD
GULFPORT-BILOXI REGIONAL AIRPORT
GULFPORT, MISSISSIPPI

SITE INVESTIGATION FINAL REPORT
VOLUME TWO

AIR NATIONAL GUARD

HAZWRAP
Oak Ridge, Tennessee 37831
Managed by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

REPORT DOCUMENTATION PAGE

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Gulfport, Mississippi

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Site Investigation Report, Volume: 2.
A Site Investigation was performed at 3 sites at the Combat Readiness Training Center, Gufport-Bolixi. The 3 sites investigated are the: Former Fire Training Area (Site 1), the Former JP-4 Bulk Storage Area, Mill Road (Site 2), and the Motor Pool Above-Ground Diesel Fuel Storage Tank Area (Site 3).

The findings of this investigation recommended further investigation at the Fire Training Area and the JP-4 Bulk Storage Tank. At Site 3 the levels of contamination did not represent a risk to human health or the environment; therefore, no further action was recommended.

Volume two of this report consisted of the following Appendixes: Site Photographs (A), Well Inventory (B), Boring Logs (C), CSL Technical Memorandum (D), Data Review and Validation (E), GPS Memorandum (F), Level C Analytical Data Summary Tables (G), Slug Test (H), Special-Status Species (I), and Representative Species of Less Mobile Fish and Wildlife (J)

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Standard Form 298 (Rev 2-89)

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AIR NATIONAL GUARD
INSTALLATION RESTORATION PROGRAM
SITE INVESTIGATION REPORT

GULFPORT FIELD TRAINING SITE
MISSISSIPPI AIR NATIONAL GUARD
GULFPORT-BILOXI REGIONAL AIRPORT
GULFPORT, MISSISSIPPI

Prepared for:

AIR NATIONAL GUARD READINESS CENTER
ANDREWS AIR FORCE BASE
MARYLAND

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the: U.S. DEPARTMENT OF ENERGY
UNDER CONTRACT NO. DE-AC05-840R21400

Prepared by:

CH2M HILL SOUTHEAST, INC.

December 1992

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CONTENTS

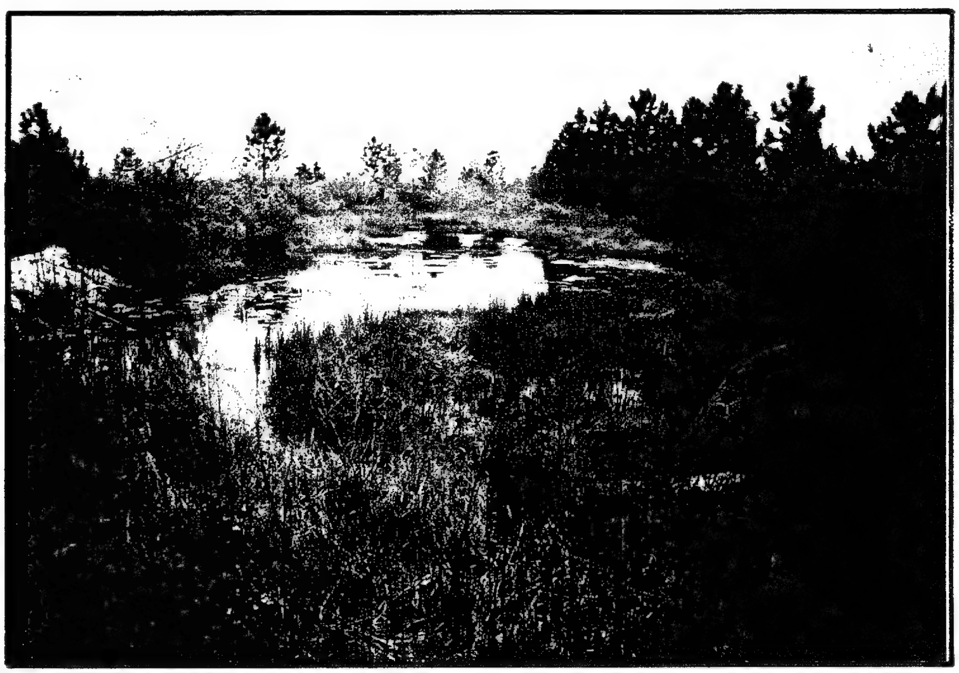
VOLUME 1

CONTENTS (Cont'd)

CONTENTS (Cont'd)

Appendix A
Site Photographs

SITE 1: FTA PIT SHOWING STANDING WATER IN PIT WITH SURFACE OVER-FLOW DITCH AT RIGHT OF PHOTO. PHOTO ALSO SHOWS CHARRED REMAINS OF AN AIRCRAFT USED IN TRAINING EXERCISES.



SITE 1: LOOKING SOUTH ALONG DRAINAGE DITCH THAT IS ADJACENT TO THE FTA.

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SITE 2: LOOKING EAST FROM ATOP THE TANK-CONTAINMENT BERM, BERNARD BAYOU IS LOCATED THROUGHOUT THE CENTER OF THE PHOTOGRAPH, SEVERAL HOMES ARE LOCATED ACROSS AND ALONG THE BAYOU. THE LOADING DOCK AND THE ABOVE-GROUND PIPING COMING TO THE TANK IS ALSO VISIBLE IN THE LEFT SIDE OF THE PHOTOGRAPH.

SITE 2: LOOKING NORTH THROUGH THE FENCELINE THAT SEPARATES THE REMAINING ANG LEASE PROPERTY FROM THE FORMER ANG LEASE PROPERTY. ALSO, LEFT CENTER, RESIDENTIAL LANDSCAPE TREES BEING PLANTED; RIGHT CENTER, PEOPLE FISHING; FAR RIGHT CENTER, BERNARD BAYOU AND WATERFRONT HOMES LOCATED ALONG THE BAYOU.

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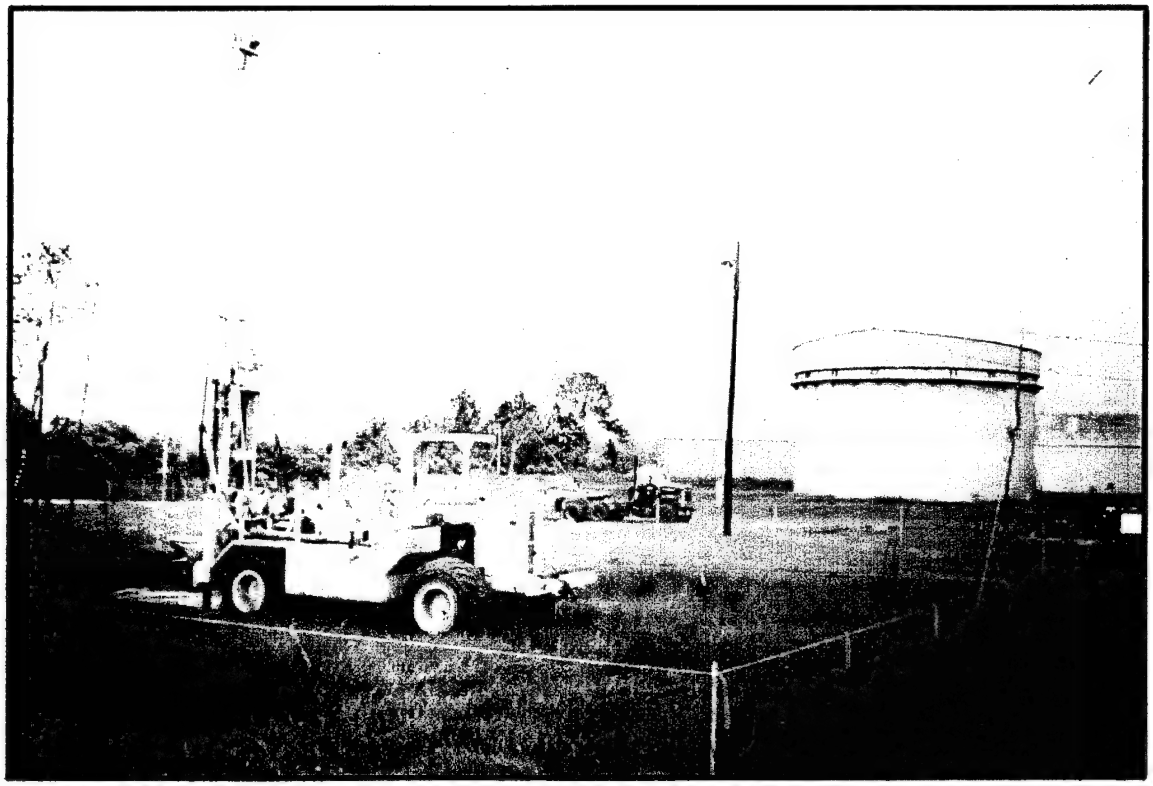
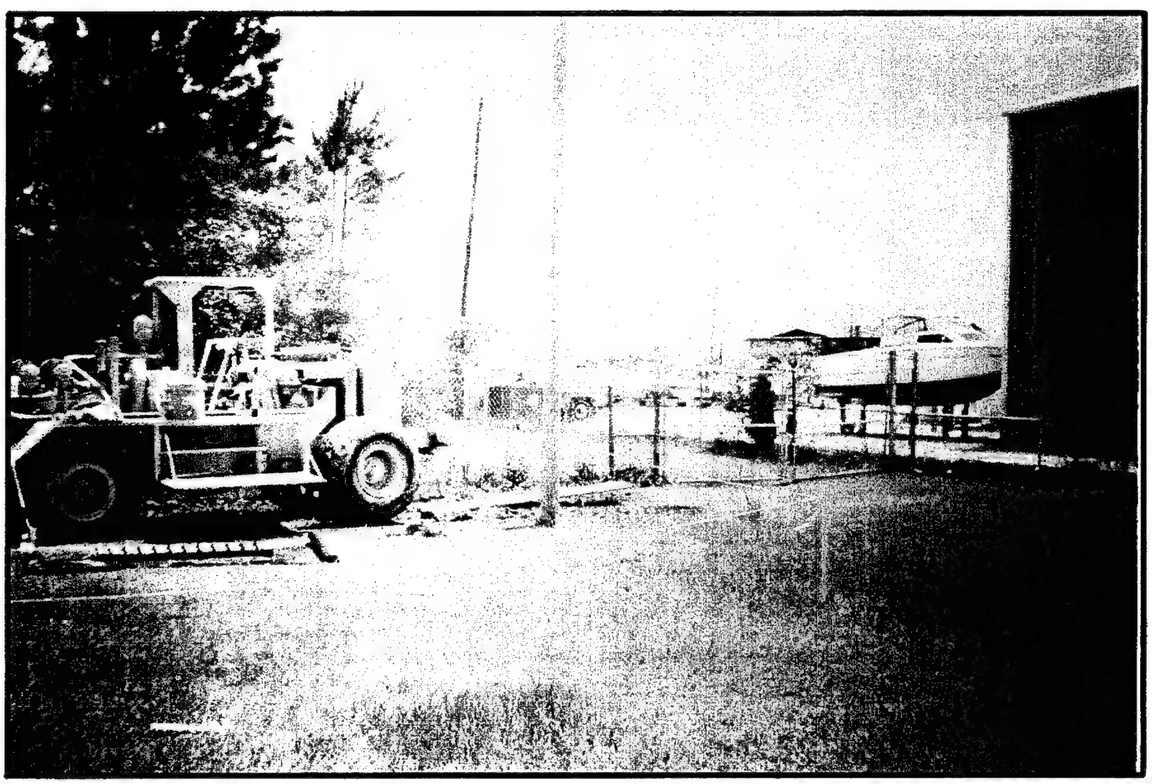


SITE 2: DRILLING RIG SET UP AT S2-MW2. DECON PAD LOCATED IN THE RIGHT CENTER OF PHOTOGRAPH. ABOVE GROUND FUEL STORAGE TANK AND RIVERBEND MARINA LOCATED IN THE BACKGROUND.



SITE 2: DRILLING RIG SET UP ON S2-PZ5, IN THE SOUTHEAST CORNER OF ANG LEASE PROPERTY. RIVERBEND MARINA LOCATED ON THE OPPOSITE SIDE OF THE FENCELINE.

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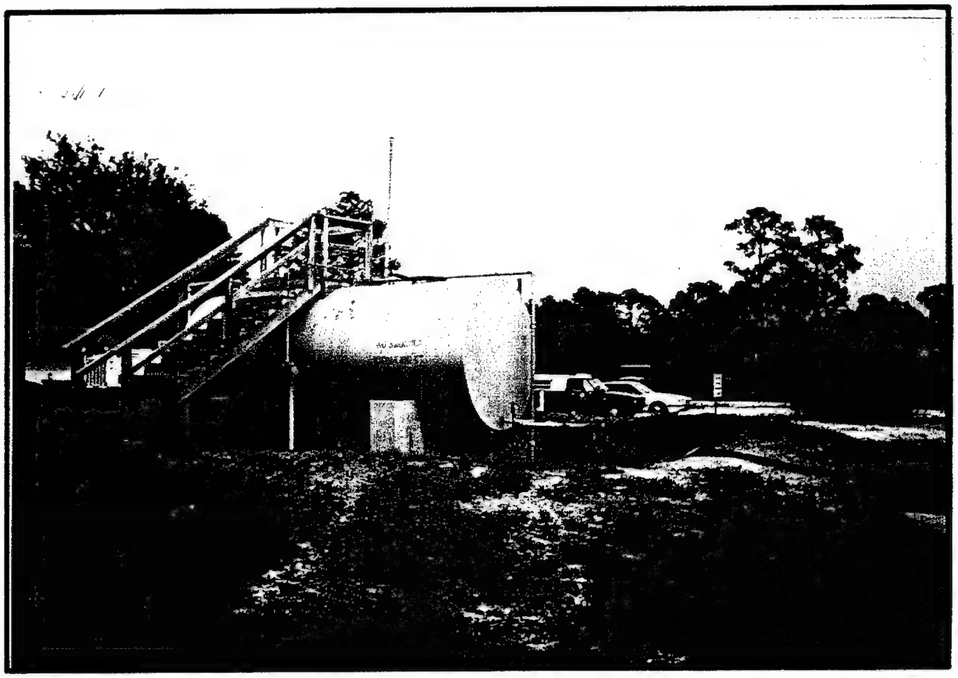

SITE 3: SOUTHERN END OF ABOVE-GROUND FUEL STORAGE TANK AND BERM.

SITE 3: NORTHERN END OF ABOVE-GROUND FUEL STORAGE TANK AND BERM. THE BLUE TRUCK IN THE CENTER OF THE PHOTOGRAPH IS LOCATED ATOP THE ADJACENT UNDERGROUND FUEL STORAGE TANKS.

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Appendix B
Well Inventory

MEMORANDUM

CH2M HILL

TO: Bob Goodson/MGM

COPIES: Scott Dwyer/SEA
Ann Castleberry/MGM
Janet Ferrill/BTR

FROM: Harold Underwood/BTR
James Adams/MGM

DATE: November 19, 1991

SUBJECT: Well Survey, Mississippi Air National Guard, Gulfport Field Training Site, Gulfport, Mississippi

PROJECT: MGM27963.A0.RP

In June 1991, CH2M HILL performed a well survey in Gulfport, Mississippi, on the area around the Mississippi Air National Guard Base (ANG), Gulfport Field Training Site. The purpose of the survey was to locate any water supply wells within a 1-mile radius from the sites under investigation. Figure 1 is a plot provided by the United States Geological Survey (USGS) that shows the general survey area. Because of the distance between the sites under investigation, approximately 800 to 900 households and 80 to 100 businesses are located within the combined 1-mile radius. Among these, it is estimated that there are five homes and one business using private well water.

The USGS plot is accompanied by a reference list of 365 operating or previously operating wells located in or near the survey area. This list provides general information about each well. The wells were located on a USGS plot according to the information provided by the driller who installed the wells. However, these locations were not verified and may prove to be inaccurate.

The city of Gulfport was contacted to determine the extent of its water supply system. According to Mr. Cecil Paige, the City of Gulfport operates 11 wells scattered throughout the city. The wells are between 850 to 900 feet deep and provide water to households and businesses within the city limits of Gulfport and to parts of Harrison County that are east of Gulfport. The city does not provide water to households and businesses north of the Seaway Canal (located northeast of survey area).

Most of the households are located in the western and eastern portions of the survey area, while most of the businesses are located in the southern and western portions of the survey area. Directly north of the survey area is Bernard Bayou, which flows east but does turns and flows south through the eastern portion of the survey area.

Several households are located along the portion of Bernard Bayou that flows through the survey area. North of the survey area along the Bernard Bayou is an industrial park.

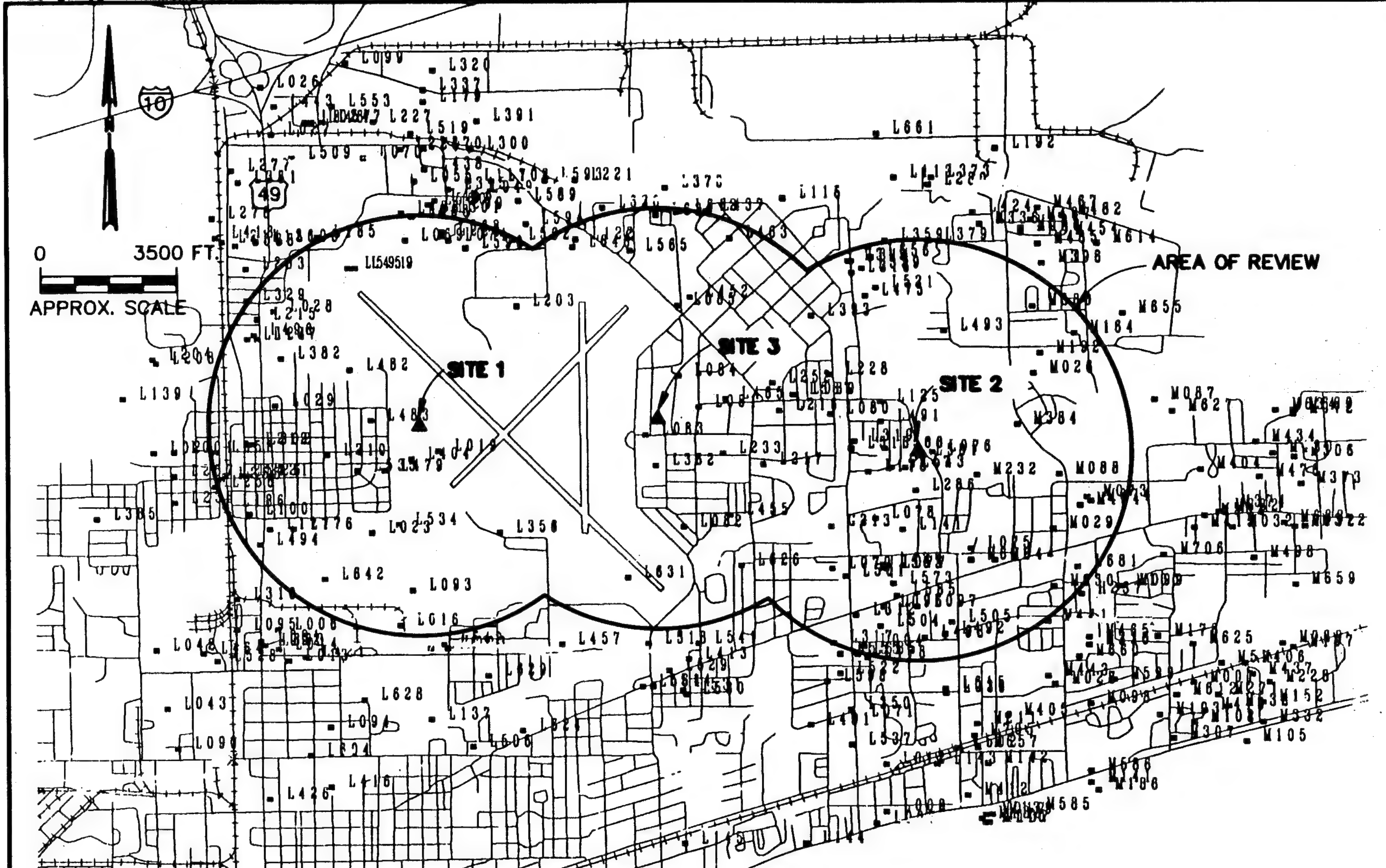
The Gulfport-Biloxi Regional Airport, which is next to the (ANG), has one well onsite. According to Mr. Larry Peoples, the well is for industrial use only. The airport uses city water for human consumption, sanitary uses, and other industrial uses. Mr. Peoples reported that the well is approximately 400 feet deep.

Two households located in the extreme western portion of the survey area have access to wells. According to Mr. Smandra of Lafayette Street, both wells are located on Lafayette Street. One well is located at his residence and is about 750 feet deep. The other well belongs to a Mr. Hornkohl. Mr. Smandra did not know the depth of this well.

According to a resident located in the northeast portion of the survey area, two households in her neighborhood have wells that are used for irrigation purposes. The resident reported that there are operating wells on the Owens property located on 52nd St. and Kendall Road and on the Longenhall property located on 54th St. and 52nd Avenue. Neither of the residents were available for verification. The depth of these are not known.

Several households throughout the survey area appear to have well houses. However, these residents stated that city water is their only water supply.

03-27-92 MGM27963.A0.RP



LEGEND

▲ APPROX. SITE LOCATION

■ L642 - USGS IDENTIFIED WELL LOCATIONS

SOURCE: USGS WELL SURVEY PLOT

FIGURE B.1
USGS WELL SURVEY PLOT
GULFPORT FIELD TRAINING SITE
Gulfport, Mississippi

CH2M HILL

GFP-0047.DWG

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PRELIMINARY DATA -- SUBJECT TO REVIEW

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302401	890245	G213 PAT MCCAFFREY	H	1140
302343	890132	H237 CURTIS BRELAND	H	294
302421	890600	L001 GULFPORT E SCH	U	786
302330	0890236	L004 GULFPORT	U	1179
302335	0890530	L006 PHILLIPS	N	1166
302245	0890233	L007 GULF PARK LANES	H	787
302248	0890230	L008 GULFPORT	U	1199
302248	0890230	L009 GULFPORT	U	1219
302318	0890212	L010 GULFPORT	U	858
302318	0890212	L011 GULFPORT	U	1193
302300	890230	L012 MAISON DE VILLE	H	868
302327	0890527	L013 COCA-COLA	U	830
302330	0890530	L014 GULFPORT	U	763
302336	0890454	L016 GULFPORT	P	815
302421	0890442	L019 LAWYER BOOSE	H	229
302400	890502	L023 NORTH GULFPORT	U	780
302421	890606	L024 HARRISON CO	I	772
302554	890533	L026 U S G S	U	18.0
302542	890530	L027 U S G S	U	60.0
302457	890530	L028 U S G S	U	40.0
302433	890530	L029 U S G S	U	35.0
302318	890212	L031 GULFPORT	P	818
302330	890606	L042 E S BENTON	H	241
302315	890603	L043 FRANK ANDREWS	H	240
302527	0890430	L049 CREOSOTE PLANT	U	753
302530	890448	L055 VARDAMAN SPEARS	H	250
302545	890518	L057 C L REAMES	H	224
302421	890548	L058 D BROWN	H	550
302515	890451	L069 J A KENNINGTON	H	193
302536	890503	L070 IRBY BROTHERS	H	784
302312	890239	L071 UPTON SISSON	H	77.0
302515	890438	L074 AUREL GOINS	H	110
302355	890204	L075 DR HARRY	H	650
302420	890215	L076 LEGETTE	H	840
302350	890229	L077 J C RENO	H	667
302403	890232	L078 GRIFFIN KAHLER	H	900
302350	890245	L079 L JAMES	H	652
302430	890245	L080 HULBERT & BLUNT	H	640
302430	890245	L080 HULBERT & BLUNT	H	640
302432	0890324	L081 U S ARMY	H	658

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302432	0890324	L081 U S ARMY	H	658
302401	890329	L082 G'PORT FIELD 4	H	650
302401	890329	L082 G'PORT FIELD 4	H	650
302425	0890340	L083 U S ARMY	U	668
302425	0890340	L083 U S ARMY	U	668
302440	0890330	L084 GULFPORT	P	645
302440	0890330	L084 GULFPORT	P	645
302458	0890330	L085 U S ARMY	U	658
302458	0890330	L085 U S ARMY	U	658
302435	890255	L089 BROAMILLER	H	70.0
302435	890255	L089 BROAMILLER	H	70.0
302305	890600	L090 MCSMITH GAMUT	U	600
302332	890535	L091 UNKNOWN	U	900
302331	890535	L092 G'PORT FEED CO	H	930
302345	890450	L093 J J HARY	H	600
302310	890515	L094 GULFPORT	Z	800
302335	890542	L095 I C RAILROAD	U	4.0
302340	890230	L096 E D SINGLETON	H	681
302340	890220	L097 MARTIN ESTATE	H	690
302330	890440	L098 JERRY O NEAL	H	340
302600	890508	L099 IND STEEL	H	735
302405	890538	L100 NINA PHILLIPS	H	466
302530	890425	L102 DAVE HALSELL	H	115
302450	890535	L107 GERALD GRAHAM	H	493
302515	0890528	L108 HOLCOMB ASPHALT	H	112
302530	890225	L113 JOHN F COYNE	H	277
302530	890432	L117 LEVERT LEVERETT	H	110
302525	890258	L118 AUSTIN CO	H	417
302515	890400	L122 R J CRESAP	H	220
302450	890538	L124 R B HILL	H	739
302433	890230	L125 W C CARTER	I	83.0
302515	890535	L136 J H THOMPSON	H	242
302312	890445	L137 JAY JAY MOTOR	H	262
302435	890615	L139 LEO STUPACK	H	209
302400	0890224	L141 V A HOSPITAL	U	1098
302300	0890215	L143 L & N RR	U	537
302240	0890254	L144 V A HOSPITAL	U	898
302240	890330	L145 T S CLOWER	H	800
302330	890445	L163 J P MARTIN	H	446
302401	890525	L176 N GULFPORT W A	U	530

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302401	890532	L177 FRED ROSE	H	270
302415	890234	L178 SHERWOOD BAILEY	H	654
302550	890445	L179 ALAN SMITH	H	202
302516	890517	L185 PAT NEWMAN	H	753
302407	890545	L186 CHARLES L JONES	H	275
302537	890155	L192 MELVIN HODGES	H	273
302458	890418	L203 USN AIRPORT ST3	H	230
302445	0890606	L204 TURN-KEY H PROJ	P	794
302444	0890605	L208 TURN-KEY H PROJ	P	754
302420	890515	L210 N GULFPORT W CO	U	811
302423	890538	L212 JAS WADE	H	640
302515	890545	L214 WILEY WOODCOCK	H	239
302455	890535	L215 LUCY COOK	H	370
302431	890300	L216 JACK GREEN	H	540
302431	890300	L216 JACK GREEN	H	540
302417	890305	L217 A G TILLMAN	H	76.0
302417	890305	L217 A G TILLMAN	H	76.0
302530	890400	L221 BETTY O'NEAL	H	113
302538	890452	L224 BILL WOMACK	H	254
302415	890540	L226 A V HAYS	H	483
302545	890500	L227 PVT SCHOOL FUND	H	472
302440	890245	L228 WM RICH	H	241
302516	890440	L229 ALPINE CORP	H	677
302420	890317	L233 J C PRICE	H	68.0
302420	890317	L233 J C PRICE	H	68.0
302408	890600	L238 ANNIE DAVIS	H	280
302545	890520	L246 CHEMFAX INC	H	110
302545	0890515	L247 CHEMFAX	N	900
302438	890302	L252 WILL RICH	H	777
302438	890302	L252 WILL RICH	H	777
302415	0890545	L254 N GULFPORT WTR	U	1400
302414	890546	L255 N GULFPORT WTR	U	900
302412	890548	L256 N GULFPORT WTR	U	490
302415	890600	L257 N GULFPORT WTR	U	760
302538	0890445	L270 CHEMFAX	H	232
302533	890542	L277 TEXACO OIL CO	H	750
302521	890548	L278 COASTAL MACHINE	H	232
302528	890215	L280 M A MANSCOE	H	294
302508	890538	L283 W WOODCOCK	H	370
302410	890220	L286 ERMS RITZ	H	857
302523	890439	L299 BERNARD MASON	H	218
302538	890431	L300 CUMMIN KING	H	130
302522	890440	L301 DORIS EVANS	H	208
302423	890537	L302 WILEY WOODCOCK	H	208
302343	0890542	L310 COCA-COLA	N	1178

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302338	890238	L312 GULF PARK LANES	H	787
302509	890239	L313 HUGH SNOWDEN	H	634
302509	890238	L314 ROBERT SOULE	H	610
302528	890438	L315 EZELL PARKER	H	110
302506	890238	L316 H B SNOWDEN	H	552
302331	890245	L317 HAZEL FRENCH	H	780
302331	890340	L318 HENRY HILL	H	315
302331	890340	L318 HENRY HILL	H	315
302423	890238	L319 O R GREEN	H	190
302558	890442	L320 NATHAN BODDIE	H	80.0
302415	890538	L321 JESSIE WILLIAMS	H	243
302500	890538	L329 STANDARD SER ST	H	739
302553	890445	L337 PLASTIFAX INC	N	253
302314	890240	L350 E M WALLACE	H	30.0
302400	890424	L356 N K CONN	H	300
302400	890424	L356 N K CONN	H	300
302514	890228	L359 C PENKINS	H	28.0
302417	890337	L362 RICHARD WILLIAM	H	515
302417	890337	L362 RICHARD WILLIAM	H	515
302528	890333	L370 ROBERT MITCHELL	I	30.0
302530	890214	L373 BOURDIN	H	30.0
302514	890215	L379 J TOMLINSON	H	340
302530	890540	L381 J P MARTIN	H	193
302445	890528	L382 GULF OIL STA	H	238
302404	890623	L385 H O BLAKE	H	322
302545	890429	L391 MARLEY CORP	H	762
302455	890250	L393 JIM PRICE	H	470
302455	890250	L393 JIM PRICE	H	470
302419	890450	L404 LC JONES HOUSNG	P	826
302327	890328	L413 GERALD GRAHAM	H	500
302327	890328	L413 GERALD GRAHAM	H	500
302255	890515	L416 JAY JAY CHEV CO	H	405
302516	0890547	L418 SHERATON INN	C	842
302328	890522	L421 CHATTANOOGA GLASS	N	820
302521	890202	L424 C LEGETT	-	616
302252	0890533	L426 GULFPORT	P	926
302522	890321	L437 BILL RANDALL	H	559
302522	890321	L437 BILL RANDALL	H	559
302533	0890445	L438 TURKEY CREEK W A	P	760
302549	890529	L443 FLAT BRANCH TRAILER	H	540

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302416	890227	L447 JIM COOPER	H	325
302500	890326	L452 DOGWOOD NURSERY	I	560
302500	890326	L452 DOGWOOD NURSERY	I	560
302404	890315	L455 V A ANDERSON	H	335
302404	890315	L455 V A ANDERSON	H	335
302525	890442	L456 RUBY L DUBUISSON	H	236
302331	0890406	L457 LOUIS HOOD	Z	855
302331	0890406	L457 LOUIS HOOD	Z	855
302508	890506	L459 A A SANDERS	H	190
302515	890314	L463 FRANK W TAYLOR	H	570
302515	890314	L463 FRANK W TAYLOR	H	570
302329	890552	L464 DR R G RITTER	H	75.0
302434	890316	L465 R W RICHARDSON	H	334
302434	890316	L465 R W RICHARDSON	H	334
302500	890234	L475 CEDAR CRES REALTY	H	386
302351	890230	L477 JOSY D'ANGELA	H	30.0
302327	890235	L478 HELEN VICKERY	H	60.0
302416	890458	L479 ROY MCCONNELL	H	30.0
302310	0890252	L481 HOWARD STUFOSO	H	30.0
302442	890508	L482 HOLLY	H	30.0
302429	890502	L483 SHOEMAKER	H	30.0
302522	890452	L488 OLIVER WHITE	H	107
302428	890230	L491 JOHN HUNTER	H	65.0
302333	890212	L492 CHARLES BAILY	H	30.0
302451	890211	L493 THOMAS FLETCHER	H	60.0
302357	890535	L494 E J FRECHE	H	104
302451	890536	L496 E L PRINCE	H	232
302332	890218	L498 SMU MISS INC	H	554
302421	890229	L500 DENNIS BRAUN JR	H	65.0
302348	890241	L501 ROLAND BAXTER	H	30.0
302304	890209	L502 PAUL FRANK	H	30.0
302350	890230	L503 ANDRE	H	30.0
302335	890231	L504 GEORGE T DARNALL	H	30.0
302336	890210	L505 L BARROW	H	30.0
302305	890433	L506 NICK FOTO	H	30.0
302536	890524	L509 PANCAKE HOUSE	H	195
302331	890340	L513 GORDON CARR	H	30.0
302331	890340	L513 GORDON CARR	H	30.0
302320	890339	L514 C E HOLCOMB	H	715
302320	890339	L514 C E HOLCOMB	H	715

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302421	890239	L516 T N ROBERTS JR	H	75.0
302542	890449	L519 SEAWAY RECYCALING	H	105
302502	890231	L521 JERRY MULLINS	H	30.0
302323	890243	L522 JESSIE CLARK	H	270
302327	890548	L528 BEATLINE NURSERY	H	482
302324	890334	L529 J L PIERCE	H	25.0
302324	890334	L529 J L PIERCE	H	25.0
302318	890329	L530 T M HAUGAN	H	30.0
302318	890329	L530 T M HAUGAN	H	30.0
302319	890330	L531 GUY ALLREO	H	30.0
302319	890330	L531 GUY ALLREO	H	30.0
302402	890454	L534 LEO ADAMS	H	30.0
302416	890506	L535 W G JULIANA	H	30.0
302305	890240	L537 BILL PICKERING	H	30.0
302514	890541	L538 MS POWER CO	H	143
302507	890235	L539 JACK BARRETT	H	610
302331	890325	L541 FRANK VARNADO	H	30.0
302331	890325	L541 FRANK VARNADO	H	30.0
302331	890441	L542 TOUPE	H	30.0
302416	890223	L543 MASON PETERSON	H	30.0
302549	890512	L553 CAMP LIVE OAK	H	688
302328	890243	L555 E J MORAN	H	35.0
302524	890444	L560 MARTHA JOHNSON	H	180
302517	890440	L562 H L GRIMES	H	225
302521	890449	L563 TED TROSTLE	H	215
302320	890342	L564 B SAUCIER	H	30.0
302320	890342	L564 B SAUCIER	H	30.0
302512	890344	L565 LJ PAVOLINI	H	30.0
302512	890344	L565 LJ PAVOLINI	H	30.0
302421	890229	L566 R L WALKER	H	30.0
302346	890227	L573 MALCOLM MALLETTE	H	690
302419	890219	L581 OSCAR O@NEIL	H	350
302343	890226	L585 BURGER KING	H	80.0
302435	890256	L587 TORRANCE SNEED	H	630
302435	890256	L587 TORRANCE SNEED	H	630
302525	890417	L589 CROWN ZELLERBACK	Z	117
302513	890433	L590 CROWN ZELLERBACK	Z	36.0
302508	890508	L591 CROWN ZELLERBACK	Z	56.0
302515	890419	L592 CROWN ZELLERBACK	Z	30.0
302530	0890409	L593 CROWN ZELLERBACK	Z	31.0

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302519	890415	L594 CROWN ZELLERBACK	Z	16.0
302321	890247	L598 E C TOSKAMS	H	80.0
302303	0890521	L604 GREEN THUMB	U	80.0
302522	890329	L612 VICTOR SHEELY	H	172
302522	890329	L612 VICTOR SHEELY	H	172
302319	890212	L615 DR HELEN HETRICK	H	155
302309	890418	L624 E A MARSHALL	H	30.0
302351	890312	L626 R P KISS	H	30.0
302351	890312	L626 R P KISS	H	30.0
302317	890505	L628 WM ALLYER	H	440
302323	890428	L629 PAUL GANN	H	440
302523	890352	L630 DOGWOOD NURSERY	I	560
302348	0890346	L631 MCGUIRE HOMES	H	400
302348	0890346	L631 MCGUIRE HOMES	H	400
302521	890336	L634 EDDIE BUTLER	H	200
302521	890336	L634 EDDIE BUTLER	H	200
302328	890238	L635 ROBERT CAMPBELL	H	258
302348	890516	L642 WEATHERLY GEN CONST	H	--
302513	0890401	L646 C J BREWER OFF CREO	U	104.
302545	0890520	L648 CHEMFAX	U	107.
302510	890232	L656 M C MORGAN	H	60.0
302541	0890230	L661 THOMAS E HILEY	H	190.
302331	0890534	L663 STERLING DRUG	N	1180
302350	0890133	L681 HANDSBORO PRES CH	H	770
302320	0890100	M007 BROADWATER	-	1040
302320	890100	M007 BROADWATER	I	1036
302247	890201	M017 JACK FAIRCHILD	H	952
302440	0890145	M026 HARRISON CO	N	752
302320	0890140	M027 GULFPORT	U	802
302320	0890140	M028 GULFPORT	U	890
302400	0890140	M029 GULFPORT	U	825
302345	0890140	M030 GULFPORT	U	920
302400	0890048	M032 GULFPORT	U	840
302429	890030	M072 JOE MILNER	H	680
302408	890130	M073 MCCARLEY	H	680
302407	0890129	M074 GEORGE PUGH	H	825
302517	890148	M085 U S FEOL SURVEY	U	25.0
302516	890148	M086 U S GEOL SURVEY	U	58.0
302433	890110	M087 U S GEOL SURVEY	U	38.0
302414	890138	M088 U S GEOL SURVEY	Z	30.0

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302330	890034	M089 GULFPORT	U	849
302315	890130	M098 J LYONS	H	836
302345	890120	M099 A R MARTINOLICH	U	700
302345	890121	M100 A R MARTINOLICH	U	900
302310	0890100	M101 U S AIR FORCE	U	900
302310	0890100	M102 U S AIR FORCE	U	970
302312	890110	M103 G P MONEY	H	850
302310	890100	M104 U S AIR FORCE	H	--
302305	890045	M105 GREAT SOUTHERN	I	800
302325	890045	M106 GREAT SOUTHERN	I	800
302329	890031	M107 GREAT SOUTHERN	U	800
302245	890200	M137 J A LEATHERS	H	--
302246	890202	M138 HENRY PIAGGIO	H	800
302247	890159	M139 W HENDRICKSON	H	922
302245	890201	M140 C W KING	H	932
302255	890130	M141 ANCHOR TOURIST	H	833
302300	0890200	M142 GULFPORT	U	915
302315	890040	M152 GULFPORT	U	799
302450	890133	M164 MISS C WATER CO	U	802
302332	890110	M178 E DANIELS	H	220
302253	890128	M186 GEO DEFORREST	H	474
302445	890143	M192 C BUCKANAN	H	292
302310	890203	M211 JOHN MICELE	H	886
302320	890038	M228 JACK GRIGGS	U	683
302414	890202	M232 FLORAL GORDENS	Z	758
302317	890053	M271 H D BLAKE	H	657
302330	0890130	M276 D R MILLER	H	285
302418	890030	M306 CLYDE BELL	H	249
302306	0890106	M307 U S AIR FORCE	U	875
302330	890130	M330 LOUIS SMITH	H	337
302310	890040	M332 W M MIZE	H	867
302518	890200	M336 J T TAYLOR	H	758
302400	890027	M372 WALTER TAYLOR	H	609
302411	890028	M373 WALTER TAYLOR	H	695
302405	890050	M374 WALTER TAYLOR	H	789
302457	890145	M380 GULFPORT	P	786
302404	890052	M382 RAYMOND BOUNDS	H	234
302427	890150	M384 KREMER MARINE	H	365
302508	890142	M398 ELROD CONST CO	H	786
302415	890057	M404 BAYOU OAK M PRK	C	820

PRELIMINARY DATA -- SUBJECT TO REVIEW

LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LOCAL WELL NUMBER	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
302312	890154	M405 H N ANDERSON	H	858
302252	890206	M412 FAIRCHILDS	C	902
302400	890059	M415 C N DAUGHDRILL	H	376
302313	890057	M418 SAM WILLIAMS	H	20.0
302419	890036	M430 ALAMO PLAZA	H	785
302422	890041	M434 H L ROGERS	H	290
302322	890043	M437 GRACE JACKSON	H	180
302336	890142	M441 RALPH GREGORY	H	287
302322	890142	M443 WILLIAM BYRD	H	1212
302515	890137	M454 BILL HOWARD	H	325
302332	890130	M465 ROBERT FORTNER	H	605
302522	890143	M467 RALPH NEWMAN	H	293
302413	890040	M476 ANNIE PATRICK	H	301
302520	890136	M482 BEULAH SUMRALL	H	280
302406	890132	M484 JAMES F SNELL	H	402
302513	890143	M485 JOHN TOMLINSON	H	282
302519	890145	M487 LESTER THORNTON	H	291
302352	890042	M498 EMMA TOTTEN	H	251
302403	890056	M502 A L ROGERS	H	644
302314	890050	M532 DON CUEVAS	H	410
302325	890052	M574 JOHN GIMMA	H	857
302248	890148	M585 W P HILABRENT	H	30.0
302258	890130	M586 A V THOMPKINS	H	28.0
302321	890123	M599 D W ALLEN	H	869
302317	0890105	M612 NAVAL HOME	P	857
302513	890126	M614 J C CHAPMAN	H	301
302330	890100	M625 J L BURNS	I	30.0
302430	890105	M627 PRESBYTERIAN CH	I	30.0
302430	0890030	M629 C Y ROBERTS	I	30.0
302400	890030	M632 GEO SIMON	I	30.0
302401	890033	M633 O R BYRD	I	30.0
302430	890035	M634 C C ISHEE	I	30.0
302352	0890157	M644 GULFPORT	P	820
302455	890119	M655 R C CROSE	H	337
302304	0890203	M657 GULFPORT	P	900
302345	890030	M659 DONALD JACOBS	H	896
302327	890133	M660 P B MCCAIN	H	30.0
302352	890204	M662 ANDREW LEVENBURGER	H	620
302307	890204	M705 RONNIE PAGE	H	700
302353	890108	M706 JIM REVIS	H	430

GROUNDWATER USAGE CODE

A-Air conditioning	I-Irrigation	R-Recreation
B-Bottling	J-Industrial(cooling)	S-Stock
C-Commercial	K-Mining	T-Institutional
D-Dewater	M-Medicinal	U-Unused
E-Power	N-Industrial	Y-Desalination
F-Fire	P-Public supply	Z-Other (explain in remarks)
H-Domestic	Q-Aquaculture	

(A) Air conditioning refers to water supply used solely or principally for heating or cooling a building. Water used to cool industrial machinery belongs in the industrial category, not in the air-conditioning category.

(B) Bottling refers to the storage of water in bottles and use of the water for potable purposes (see Medicinal).

(C) Commercial use refers to use by a business establishment that does not fabricate or produce a product. Filling stations and motels are examples of commercial establishments. If some product is manufactured, assembled, remodeled, or otherwise fabricated, use of water for that plant should be considered industrial, even though the water is not used directly in the product or in the manufacturing of the product.

(D) Dewatering means the water is pumped for dewatering a construction or mining site, or to lower the water table for agricultural purposes. In this respect, it differs from a drainage well that is used to drain which the water is withdrawn is to provide drainage, dewatering should be indicated even though the water may be discharged into an irrigation ditch and subsequently used to irrigate land.

(E) Power generation refers to use of water for generation of any type of power.

(F) Fire protection refers to the principal use of the water and should be indicated if the site was constructed principally for this purpose, even though the water may be used at times to supplement an industrial or defense supply, to irrigate a golf course, fill a swimming pool, or for other use.

Taken from USGS NWIS 90.1 GWSI System, GWSI Coding, Vol. 2, Chap.4, Pgs. 2-30 thru 2-33

(H) Domestic use is water used to supply household needs, principally for drinking, cooking, washing, and sanitary purposes, but including watering a lawn and caring for a few pets. Most domestic wells will be at suburban or farm homes, but wells supplying small quantities of water for domestic purposes for one-classroom schools, turnpike gates, and similar installations, should be in the domestic category.

(I) Irrigation refers to the use of water to irrigate cultivated plants. Most irrigation sites will supply water for farm crops, but the category should include wells used to water the grounds of schools, industrial plants, or cemeteries, if more than a small amount of water is pumped and that is the sole use of the water.

(J) Industrial cooling refers to a water supply used solely for industrial cooling.

(K) Mining refers to a water supply used solely for mining purposes.

(M) Medicinal refers to water purported to have therapeutic value. Water may be used for bathing and/or drinking. If use of water is mainly because of its claimed therapeutic value, use this category even though the water is bottled.

(N) Industrial use is within a plant that manufactures or fabricates a product. The water may or may not be incorporated into the product being manufactured. Industrial water may be used to cool machinery, to provide sanitary facilities for employees, to air condition the plant, and to irrigate the ground at the plant.

(P) Public Supply use is water that is pumped and distributed to several homes. Such supplies may be owned by a municipality or community, a water district, or a private concern. In most States, public supplies are regulated by departments of health which enforce minimum safety and sanitary requirements. If the system supplies five or more homes, it should be considered a public supply, as four or less classify use as domestic. Water supplies for trailer or summer camps with five or more living units should be in this category, but motels and hotels are classified as commercial. Most public supply systems also furnish water for a variety of other uses, such as industrial, institutional, and commercial.

(Q) Aquaculture refers to a water supply used solely for aquaculture, such as fish farms.

Taken from USGS NWIS 90.1 GWSI System, GWSI Coding, Vol. 2, Chap.4, Pgs. 2-30 thru 2-33

(R) Recreation refers to water discharged into pools (or channels which are dammed downstream to form pools), for swimming, boating, fishing, ice rinks, and other recreational uses.

(S) Stock Supply refers to the watering of livestock.

(T) Institutional refers to water used in the maintenance and operation of institutions such as large schools, universities, hospitals, rest homes, or similar installations. Owners of institutions may be individuals, corporations, churches, or governmental units.

(U) Unused means water is not being removed from the site for one of the purposed described above. A test hole, oil or gas well, recharge, drainage, observation, or waste-disposal well will be in this category.

Do not use this classification for an irrigation, domestic, stock, or other well during "off season" or temporary periods of nonuse. The use of water from a newly constructed site should be considered as the use for which it is intended even though it may not yet be in use when inventoried.

(Y) Desalination refers to water used in a desalting process whereby dissolved solids are removed to make water potable or suitable for other uses. Enter the type of use of the desalinated water in the next column, "Secondary Water Use".

(Z) Other refers to miscellaneous uses not included in the listed categories.

Taken from USGS NWIS 90.1 GWSI System, GWSI Coding, Vol. 2, Chap.4. Pgs. 2-30 thru 2-33

Appendix C
Boring Logs

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
MGM27963.AO.FW	S1-B1	

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.1 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/07/91 FINISH 05/07/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.9	5-7-7-8 (14)	UPPER 0.4' WET SOIL w/SHELLS. LOWER 0.5 POORLY GRADED SAND, (SP), gray to light gray, wet, medium dense, fine to medium grained.	>1000	Start drilling @ 1535
2		S-2	0.9	2-3-4-5 (7)	POORLY GRADED SAND w/SILT, (SP-SM), light gray, wet, loose, dense, fine grained.	>1000	
4		S-4	1.0	2-2-3-2 (5)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-2.	>1000	
6					End of boring @ 4' Sampled to 6'		Stop drilling @ 1555

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER MGM27963.AO.FW	BORING NUMBER S1-B2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.3 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/07/91 FINISH 05/07/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.2	2-5-3-4 (8)	UPPER 0.2' SHELL w/ORGANIC SOIL. LOWER 1.0 POORLY GRADED SAND, (SP), light gray, wet, loose, fine to medium grained.	>1000	Start drilling @ 1640
2		S-2	0.4	4-5-7-4 (12)	POORLY GRADED SAND w/SILT, (SP-SM), gray, wet, medium dense, fine grained.	>1000	
4		S-4	0.7	1-1-1-2 (2)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-2.	>1000	Stop drilling @ 1655 Start drilling @ 1715
6					End of boring @ 4' Sampled to 6'		Stop drilling @ 1725

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S1-B3	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.0 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/07/91 FINISH 05/07/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.3	3-5-10-10 (15)	POORLY GRADED SAND w/SILT, (SP-SM), gray to light gray, wet, medium dense, fine grained.	>1000	Start drilling @ 1750
2		S-2	0.8	4-1-3-4 (4)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-0, very loose.	800	
4		S-4	0.6	2-3-3-2 (6)	POORLY GRADED SAND w/CLAY, (SP-SC), light gray to gray, w/some tan, wet loose dense, fine grained, clay in tip.	960	
6					End of boring @ 4' Sampled to 6'		Stop drilling @ 1825

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S1-PZ1	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.8 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 21.17 (FT. MSL) 06/18/91 START 05/07/91 FINISH 05/07/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.6	2-3-4-10 (7)	UPPER 0.6' ORGANIC SOIL w/SAND, (OL), dark tan and dark brown. LOWER 1.0' POORLY GRADED SAND, (SP), beige, white, moist loose dense, medium to fine grained.	140	Start drilling @ 0950
		S-2	0.7	6-10-8-5 (18)	POORLY GRADED SAND, (SP), similar to S-0, wet, organics @ 3.9'-4.0'	40	
5		S-4	0.1	1-WOH-1-WOH (1)	POORLY GRADED SAND, (SP), similar to S-2.	–	
		S-6	1.3	1-2-1-2 (3)	LEAN CLAY, (CL), gray, wet, soft.	340	
		S-8	1.3	1-4-4-5 (8)	LEAN CLAY, (CL), gray, tan, beige, moist, firm.	10	
10					End of boring @ 8' Sampled to 10' Screen interval 4.5'-7'		Stop drilling @ 1020

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S1-PZ2	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.8 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 20.41 (FT. MSL) 06/18/91 START 05/07/91 FINISH 05/07/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.5	7-12-12-9 (24)	SHELLS w/ORGANIC SOIL, (OL).	50	Start drilling @ 1300
		S-2	0.5	7-9-5-10 (14)	POORLY GRADED SAND, (SP), beige, white, moist, medium dense, medium to fine grained, organics present.	200	
5		S-4	0.7	2-2-2-3 (4)	POORLY GRADED SAND, (SP), wet, very loose, fine grained.	700	
		S-6	1.5	WOH-1-1-3 (2)	CLAYEY SAND, (SC), gray to light gray w/tan stringers, wet, very loose, fine grained.	500	
		S-8	0.4	2-2-2-3 (4)	CLAYEY SAND, (SC), similar to S-6 w/more clay.	190	
10					End of boring @ 8' Sampled to 10' Screen interval 4.5'-7'		Stop drilling @ 1330

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S1-PZ3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.3 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 20.35(FT. MSL) 06/18/91 START 05/03/91 FINISH 05/03/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.9	2-3-6-5 (9)	UPPER 0.2' ORGANIC SOIL w/SAND, (OL), black to dark brown, LOWER 0.7' POORLY GRADED SAND, (SP), light gray, wet, loose, fine grained.	8	Start drilling @ 1315
		S-2	1.9	2-2-4-6 (6)	UPPER 1.0' POORLY GRADED SAND w/SILT, (SP-SM), light gray, wet, loose, fine grained LOWER 0.9' SILTY SAND, (SM), dark gray, wet, loose, dense, fine grained.	-	
5		S-4	1.3	3-5-5-6 (10)	POORLY GRADED SAND w/SILT, (SP-SM), gray, wet, loose, dense, fine grained.	120	
		S-6	0.8	3-3-5-7 (8)	POORLY GRADED SAND w/CLAY, (SP-SC), light gray, tan, moist, loose, fine grained.	3	
		S-8	0.8	3-3-5-4 (8)	CLAYEY SAND, (SC), light tan to light gray, moist, loose, fine grained.	1	
10					End of boring @ 8' Sampled to 10' Screen interval 7.5'-10'		Stop drilling @ 1350

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S1-MW1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.2 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 20.70(FT. MSL) 06/18/91 START 05/09/91 FINISH 05/09/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.4	10-15-14-16 (29)	UPPER 0.6' SHELLS w/SILTY SAND, LOWER 0.8' SILTY SAND, (SM), tan to light brown, gray, dry to moist, dense, fine grained.	340	Start drilling @ 0820
		S-2	1.0	3-6-3-6 (9)	UPPER 0.5' POORLY GRADED SAND, (SP), gray, wet, loose, dense, fine grained. LOWER 0.5' SILTY SAND, (SM), gray, moist to wet, loose, fine grained, black organic banding.	>1000	
5		S-4	0.6	2-3-3-3 (6)	SILTY SAND, (SM), dark gray, wet, loose, dense, fine grained.	>1000	
		S-6	0.5	WOH-2 (0)	UPPER 0.3' SILTY SAND, (SM), similar to S-4, very loose, LOWER 0.2', CLAYEY SAND, (SC), light gray, tan, wet, very loose, fine grained.	480	
		S-8	2.0	5-7-7-6 (14)	UPPER 0.4' CLAYEY SAND, (SC), similar to S-6, LOWER 1.6' LEAN CLAY, (CL), gray tan modeling, moist, stiff.	16	
10					End of boring @ 8' Sampled to 10' Screen interval 4.5'-7'		Stop drilling @ 0900

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S1-MW2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.1 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 20.61(FT. MSL) 06/18/91 START 05/09/91 FINISH 05/09/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.2	10-11-16-19 (27)	SHELLS w/SILTY SAND, fill material.	>1000	Start drilling @ 1057
		S-2	0.8	7-7-6-5 (13)	SILTY SAND, (SM), gray, moist, medium dense, fine grained.	>1000	
5		S-4	0.4	2-2-1-1 (3)	SILTY SAND, (SM), gray, wet, very loose, fine grained.	>1000	
		S-6	1.9	WOH-1-2 (1)	SILTY SAND, (SM), gray, tan, brown, wet, very loose, fine grained.	>1000	
		S-8	1.6	1-1-2-3 (3)	CLAYEY SAND, (SC), gray, tan, moist, very loose.	9	
10					End of boring @ 8' Sampled to 10' Screen interval 4.5'-7'		Stop drilling @ 1140

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S1-MW3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.7 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 19.76 (FT. MSL) 06/18/91 START 05/09/91 FINISH 05/09/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.1	5-8-6-8 (14)	UPPER 0.5' ORGANIC SOIL w/SHELL SILT AND SAND, (OL), dark brown, LOWER 0.6', POORLY GRADED SAND, (SP), beige, light brown, tan, moist, medium dense, fine grained.	14	Start drilling @ 1409
		S-2	1.0	6-7-10-7 (17)	UPPER 0.4'POORLY GRADED SANDw/SILT,(SP-SM), brown to beige, moist to wet, meidum dense, fine grained,LOWER 0.6' SILTY SAND, (SM), gray, moist,medium dense,fine grained,oganics present.	260	
5		S-4	1.6	2-2-3-4 (5)	CLAYEY SAND, (SC), gray, dark gray, wet, loose, dense, fine grained.	-	
		S-6	0.2	1-1-2-1 (3)	CLAYEY SAND, (SC), tan, beige, modeling, wet, soft.	200	
		S-8	1.8	1-2-2-4 (4)	CLAYEY SAND, (SC), similar to S-6.	3	
10					End of boring @ 9.5' Sampled to 10' Screen interval 4.5'-7'		Stop drilling @ 1555

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER MGM27963.AO.FW

BORING NUMBER BKGD-MW1

SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 21.5 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 20.45(FT. MSL) 06/17/91 START 05/08/91 FINISH 05/08/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	HEADSPACE READINGS (PPM)	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.7	2-5-7-7 (12)	UPPER 0.2' ORGANIC SOIL w/SAND, (OL), LOWER 0.5' POORLY GRADED SAND, (SP), light gray to gray, wet, medium dense, fine grained.	3	Start drilling @ 0920
		S-2	1.5	2-2-3-3 (5)	POORLY GRADED SAND, (SP), gray, wet, loose, dense, fine grained.	6	Sand running up augers.
5		S-4	0.5	1-1-2-2 (3)	POORLY GRADED SAND, (SP), similar to S-2, very loose.	-	
		S-6	1.9	WOH-1-2-2 (3)	UPPER 1.0' CLAYEY SAND, (SM), tan to gray, wet, very loose, fine grained LOWER 0.9' POORLY GRADED SAND, (SP), tan to gray, wet, very loose, fine grained.	180	
		S-8	0.9	2-4-4-5 (8)	CLAYEY SAND, (SC), gray, tan, wet, firm.	7	
10		ST-10	1.2	-	CLAYEY SAND, (SC), similar to S-8.	-	
					End of boring @ 10' Sampled to 12' Screen interval 4.5'-7'		Stop drilling @ 1005

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S2-B1	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 7.1 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.0	2-4-6-6 (10)	UPPER 0.3' ORGANIC SOIL w/SAND, (OL), LOWER 0.7' POORLY GRADED SAND w/SILT, (SP-SM), brown to tan to gray to black, moist, loose, dense, fine grained.	26	Start drilling @ 1500
		S-2	1.0	2-2-2-4 (4)	POORLY GRADED SAND w/SILT, (SP-SM), beige, tan, moist, very loose, fine grained.	400	
5		S-4	1.6	1-1-3-5 (4)	SILT w/SAND, (SM), tan to light brown to light gray, wet, soft, fine grained sand.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1520

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S2-B2	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 7.4 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.6	1-2-3-2 (5)	UPPER 0.7' ORGANIC SOIL w/SAND, (OL), LOWER 0.9' POORLY GRADED SAND w/SILT, (SP-SM), tan to light brown, moist to wet, loose, dense, fine grained.	26	Start drilling @ 1405
		S-2	1.7	1-1-2-3 (3)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-0	400	
5		S-4	1.9	1-2-4-7 (6)	UPPER 1.4' SILTY SAND, (SM), tan to beige, moist to wet, loose, dense, fine grained. LOWER 0.5' SILT, (ML), tan to beige to brown to light gray, moist, firm.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1425

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 7.4 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.7	3-4-5-6 (9)	POORLY GRADED SAND, (SP), light gray, moist, loose, dense, fine grained.	7	Start drilling @ 1658
		S-2	0.7	5-2-3-5 (5)	POORLY GRADED SAND w/SILT, (SP-SM), tan to light gray, moist, loose, dense, fine grained.	>1000	
5		S-4	1.6	2-3-5-6 (8)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-2.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1715

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2–B4	SHEET 1 OF 1

SOIL BORING LOG

PROJECT: GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG — LOCATION: GULFPORT, MISSISSIPPI

ELEVATION: 4.9 (FT. MSL) — DRILLING CONTRACTOR: GEOTECHNICAL ENGINEERING–TESTING, INC.

DRILLING METHOD AND EQUIPMENT: CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE: N/A — START: 05/15/91 — FINISH: 05/15/91 — LOGGER: H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.5	1-2-1-2 (3)	UPPER 0.4' ORGANIC SOIL w/SAND, (OL), LOWER 1.1' SILTY SAND, (SM), beige, tan, moist to wet, very loose, fine grained. Clay present @ 1.8-2.0'	12	Start drilling @ 1140
		S-2	2.0	1-2-5-8 (7)	SILTY SAND, (SM), tan to beige to light gray, moist, loose, dense.	6	
5		S-4	2.0	1-3-5-5 (8)	SILT w/SAND, (SM), light gray to tan to light brown, moist, firm.	200	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1150

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B5	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 6.5 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.0	2-2-2-4 (4)	SILTY SAND, (SM), gray to beige, moist, very loose, fine grained, organics present.	6	Start drilling @ 1327
		S-2	2.0	2-2-2-4 (4)	SILT w/SAND, (ML), brown to light tan, moist, very loose, fine grained.	>1000	
5		S-4	2.0	1-3-4-10 (7)	CLAYEY SAND, (SC), light gray to tan to beige, moist to wet, loose, dense, fine grained.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1340

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B6	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 8.5 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	HEADSPACE READINGS (PPM)	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.5	1-1-1-1 (2)	UPPER 0.5' ORGANIC SOIL w/SILTY SAND, (OL), LOWER 1.0' CLAYEY SAND, (SC), light brown to tan, moist to wet, soft.	7	Start drilling @ 1800
		S-2	1.6	1-3-5-5 (8)	CLAYEY SAND, (SC), similar to S-0.	40	
5		S-4	1.2	1-2-4-4 (6)	CLAYEY SAND, (SC), similar to S-0.	6	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1815

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B7	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 3.5 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/14/91 FINISH 05/14/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	HEADSPACE READINGS (PPM)	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.5	4-4-4-5 (8)	ORGANIC SOIL w/SAND, (OL), dark brown, wet, loose, dense, fine grained.	-	Start drilling @ 1725
		S-2	1.0	3-3-5-4 (8)	UPPER 0.3' SILTY SAND, (SM), dark gray, wet, loose, dense, fine grained. LOWER 0.7' POORLY GRADED SAND w/SILT, (SP-SM), light gray to gray, wet, loose, dense, fine grained.	600	
5		S-4	0.4	WOH-1-1-2 (2)	SILTY SAND, (SM), dark gray, wet, very loose, fine grained.	50	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1805

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B10	SHEET 1 OF 1

SOIL BORING LOG

PROJECT: GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG — LOCATION: GULFPORT, MISSISSIPPI

ELEVATION: 4.9 (FT. MSL) — DRILLING CONTRACTOR: GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT: CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE: N/A — START: 05/14/91 — FINISH: 05/14/91 — LOGGER: H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.4	2-5-5-4 (10)	UPPER 0.2' ORGANIC SOIL w/SAND, (OL), dark brown, wet. LOWER 1.2' SILT w/SAND, (ML), beige to light tan, moist to wet, stiff, fine grained sand.	100	Start drilling @ 0905
		S-2	1.4	1-3-3-4 (6)	SILTY SAND, (SM), beige to light tan, moist to wet, loose dense, fine grained.	>1000	
5		S-4	2.0	1-3-4-6 (7)	CLAYEY SAND, (SC), light gray to tan, moist to wet, firm.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 0930

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
MGM27963.A0.FW	S2-B11	

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 6.2 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.3	1-3-5-5 (8)	SILTY SAND, (SM), brown to beige, moist, loose dense, fine grained.	2	Start drilling @ 0950
		S-2	1.4	1-2-2-3 (4)	SILT, (ML), reddish tan to brown, moist, soft.	5	
5		S-4	1.5	2-2-2-4 (4)	CLAYEY SAND, (SC), light gray to tan, moist, very loose, fine grained.	4	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1015

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-B12	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 6.7 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE N/A START 05/15/91 FINISH 05/15/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.0	1-2-3-1 (5)	UPPER 0.2' ORGANIC SOIL, (OL), LOWER 0.8' SILTY SAND, (SM), beige to light brown, moist to wet, loose, fine grained.	3	Start drilling @ 1045
		S-2	1.2	2-3-3-4 (6)	SILTY SAND, (SM), tan to light brown, wet, loose, dense, fine grained.	16	
5		S-4	1.9	1-3-3-6 (6)	CLAYEY SAND, (SC), beige to tan to ligt brown, moist, firm, fine grained.	>1000	
					End of boring @ 4' Sampled to 6'		Stop drilling @ 1105

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-PZ1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 4.6 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.65 (FT. MSL) 06/17/91 START 05/13/91 FINISH 05/13/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.2	4-6-6-3 (12)	ORGANIC SOIL w/SANDY SILT, (OL), red brick in tip of spoon.	2	Start drilling @ 1050
		S-2	0.7	1-2-5-5 (7)	SILT (ML), tan to light brown to beige, moist, firm.	0	
5		S-4	1.5	2-2-3-5 (5)	CLAYEY SAND, (SC), beige to light gray to tan to light brown, moist, firm.	0	
		S-6	1.2	5-7-12-9 (19)	UPPER 0.8'POORLY GRADED SAND w/CLAY,(SP-SC), beige to tan, moist, medium dense, fine grained LOWER 0.4' CLAYEY SAND, (SC), tan to beige, moist, medium dense, fine grained.	1	
		S-8	1.7	2-4-7-7 (11)	CLAYEY SAND, (SC), tan to beige, moist, medium dense, fine grained.	1	
10		S-10	2.0	1-2-4-6 (6)	UPPER 0.9' POORLY GRADED SAND w/CLAY, (SP-SC), beige to tan, wet, loose, fine grained LOWER 1.1' POORLY GRADED SAND, (SP), tan to beige, wet, loose, dense, fine grained.	1	
		S-12	2.0	8-10-19-35 (29)	POORLY GRADED SAND, (SP), beige, tan, wet, medium dense, medium to large grained, approx. 5% quarts gravel.	4	
15					End of boring @ 14' Sampled to 14' Screen interval 11.5'-14'		Stop drilling @ 1225 Lunch Start drilling @ 1350 Stop drilling @ 1355

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-PZ2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 8.6 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 5.56 (FT. MSL) 06/17/91 START 05/13/91 FINISH 05/13/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	2.0	1-1-2-1 (3)	UPPER 0.5' ORGANIC SOIL w/SAND, (OL), MIDDLE 1.5' POORLY GRADED SAND w/CLAY, (SP-SC), beige to tan, wet, very loose, fine grained. More clay in lower 0.7'.	12	Start drilling @ 1545
		S-2	1.0	1-2-1-4 (3)	CLAYEY SAND, (SC), light gray to beige to tan modeling, wet, very loose, fine grained.	3	
5		S-4	1.7	1-2-4-8 (6)	CLAYEY SAND, (SC), tan to reddish beige to light gray, moist, loose dense, fine grained.	0	
		S-6	1.0	8-10-12-12 (22)	POORLY GRADED SAND w/CLAY,(SP-SC), light gray to reddish tan, wet, medium dense, fine grained.	5	
		S-8	1.2	5-5-6-8 (11)	POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-6.	1	
10		S-10	1.8	2-2-4-5 (6)	UPPER 0.9' POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-6, loose LOWER 0.9' POORLY GRADED SAND, (SP), beige to light brown, wet, loose, dense, fine grained.	1	
		S-12	0.3	3-5-2-2 (7)	POORLY GRADED SAND, (SP), similar to S-10.	40	
15					End of boring @ 14' Sampled to 14' Screen interval 11.5'-14'		Stop drilling @ 1655

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
MGM27963.AO.FW	S2-PZ3	

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 2.9 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.96 (FT. MSL) 06/17/91 START 05/14/91 FINISH 05/14/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.2	1-1-1-2 (2)	UPPER 0.9' ORGANIC SOIL w/SILT and SAND, (OL), LOWER 0.3' POORLY GRADED SAND, (SP), gray and black organics, wet, very loose, fine grained.	550	Start drilling @ 1500
		S-2	2.0	1-1-2-2 (3)	CLAYEY SAND, (SC), gray to tan, wet, very loose, fine grained, organics throughout, red brick @ 3.7'.	>1000	
5		S-4	1.0	WOH-1-1 (1)	CLAYEY SAND, (SC), light gray to tan, upper 0.4' wet, lower 0.6' moist, very loose, fine grained, organics throughout.	>1000	
		S-6	1.4	3-10-15-15 (25)	UPPER 0.5' SILTY SAND,(SM), light gray to light tan, moist to wet, medium dense, fine grained. LOWER 0.9' POORLY GRADED SAND,(SP), beige to light gray, wet, medium dense, fine grained.	>1000	
		S-8	1.5	4-9-9-14 (18)	POORLY GRADED SAND, (SP), similar to S-6.	650	
10					End of boring @ 10' Sampled to 10' Screen interval 7.5'-10'		Stop drilling @ 1535

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-PZ4	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI
ELEVATION 8.2 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.
DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV. RIG, 3.25" I.D. HOLLOW STEM AUGERS
WATER LEVEL AND DATE 3.96 (FT. MSL) 06/17/91 START 05/14/91 FINISH 05/14/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.5	2-2-2-1 (4)	UPPER 0.6' ORGANIC SOIL w/SAND and CLAY, (OL), LOWER 0.9' CLAYEY SAND, (SC), brown to tan, moist to wet, very loose, fine grained.	0	Start drilling @ 0750
		S-2	2.0	1-2-2-4 (4)	SILT w/SAND, (ML), light brown to tan, wet, soft.	0	
5		S-4	1.8	1-4-6-8 (10)	LEAN CLAY w/SAND, (CL), light gray to tan, moist, stiff.	600	
		S-6	1.3	2-4-6-8 (10)	CLAYEY SAND, (SC), light gray to tan modeling wet, loose dense, fine grained.	>1000	
		S-8	1.2	4-6-8-8 (14)	POORLY GRADED SAND w/CLAY, (SP-SC), light gray to brown, wet, medium dense, fine to medium grained.	>1000	
10		S-10	1.6	2-4-3-4 (7)	UPPER 1.2' POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-8 LOWER 0.4' CLAYEY SAND, (SC), light gray, moist, loose dense, fine grained.	600	
		S-12	1.8	4-10-11-15 (21)	UPPER 0.6' CLAYEY SAND, (SC), similar to S-10 wet, medium dense LOWER 1.2' POORLY GRADED SAND, (SP), light gray to tan, wet, medium dense, fine grained.	-	
15					End of boring @ 14' Sampled to 14' Screen interval 8.5'-11'		Stop drilling @ 0850

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
MGM27963.AO.FW	S3-PZ3	

SOIL BORING LOG

PROJECT: GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG   LOCATION: GULFPORT, MISSISSIPPI

ELEVATION: 22.5 (FT. MSL)   DRILLING CONTRACTOR: GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT: CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE: 18.96 (FT. MSL) 06/17/91   START: 04/30/91   FINISH: 04/30/91   LOGGER: H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.2	2-6-7-6 (13)	UPPER 0.8' ORGANIC FILL, dark brown to black, shell layer 0.7-0.8' LOWER 0.4' POORLY GRADED SAND,(SP),gray, moist to wet, medium dense, fine grained.	0	Start drilling @ 1300
		S-2	1.8	2-3-3-4 (6)	POORLY GRADED SAND, (SP), light gray w/tan staining, wet, loose, ~3-5% silt.	0	
5		S-4	1.7	1-1-2-4 (3)	CLAYEY SAND, (SC), tan to light gray modeling, moist to wet, very loose, fine grained, clay stringers present throughout.	0	
		S-6	1.2	4-11-13-17 (24)	POORLY GRADED SAND w/SILT, (SP-SM), light tan to tan to light gray, moist to wet, medium dense, medium to fine grained.	1	
		S-8	1.0	2-3-10-13 (13)	POORLY GRADED SAND, (SP), light pink-gray, moist to wet, medium dense, medium to fine grained.	1	
10		S-10	0.9	5-6-5-3 (11)	POORLY GRADED SAND w/SILT, (SP-SM), tan to gray, wet, medium dense, fine grained.	0	
		S-12	1.9	WOH-12-15 (12)	UPPER 1.1' LEAN CLAY w/SAND, (CL), gray, moist to wet, soft LOWER 0.8' POORLY GRADED SAND, (SP), gray, wet, medium dense, fine to medium grained.	1	
15		S-14	2.0	1-3-6-5 (9)	POORLY GRADED SAND, (SP), gray, wet, loose, medium to fine grained.	1	
					End of boring @ 16' Sampled to 16' Screened interval 10.4-14.4'		Stop drilling @ 1350

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY   D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S3-MW1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.7 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 19.60 (FT. MSL) 06/17/91 START 04/30/91 FINISH 04/30/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	HEADSPACE READINGS (PPM)	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.3	2-4-4-6 (8)	POORLY GRADED SAND, (SP), dark gray, moist, loose, fine grained.	1	Start drilling @ 1525
		S-2	1.8	2-3-4-3 (7)	POORLY GRADED SAND w/SILT, (SP-SM), tan to gray to light gray, wet, loose, fine grained.	1	
5		S-4	1.0	1-2-4-8 (6)	POORLY GRADED SAND w/CLAY, (SP-SC), beige to light gray to tan, wet, loose, fine grained.	3	
		S-6	1.9	8-13-13-14 (26)	POORLY GRADED SAND, (SP), beige to tan, wet, medium dense, fine grained.	4	
		S-8	1.2	5-5-6-5 (11)	POORLY GRADED SAND, (SP), tan to beige to gray, wet, medium dense, fine grained.	5	
10					End of boring @ 10' Sampled to 10' Screened interval 5-10'		Stop drilling @ 1602

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
MGM27963.AO.FW	S2–PZ5	

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 4.2 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING–TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.42 (FT. MSL) 06/17/91 START 05/14/91 FINISH 05/14/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S–0	1.0	WOH–1–2–2 (3)	UPPER 0.4' ORGANIC SOIL w/SILT, (OL), dark brown LOWER 0.6' SILT, (ML), reddish tan, moist, soft.	10	Start drilling @ 1115
		S–2	1.7	1–1–2–1 (3)	SILT, (ML), similar to S–0	>1000	
5		S–4	1.3	3–5–6–7 (11)	LEAN CLAY w/SAND, (CL), reddish tan to light gray, moist to wet, stiff.	>1000	
		S–6	1.8	3–5–9–9 (14)	POORLY GRADED SAND w/SILT, (SP–SM), light gray to tan, wet, medium dense, fine grained.	420	
		S–8	1.8	3–7–10–12 (17)	POORLY GRADED SAND, (SP), beige to light gray, wet, medium dense, fine grained, some silt @ 8.5–9.0'.	140	
10					End of boring @ 10' Sampled to 10' Screen interval 7.5'–10'		Stop drilling @ 1155

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2–MW1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 6.4 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING–TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 2.38 (FT. MSL) 06/17/91 START 05/20/91 FINISH 05/20/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S–0	0.5	3–6–4–5 (10)	ORGANIC SOIL w/SILTY SAND, (OL), dark brown, moist; loose, fine grained.	4	Start drilling @ 1300
		S–2	1.3	1–1–2–2 (3)	UPPER 0.3' red brick fragments LOWER 1.0' SILT, (ML), light brown, moist, soft.	0	
5		S–4	2.0	1–1–4–4 (5)	SILT w/SAND, (ML), light brown to tan to beige, moist, firm.	1	
		S–6	1.7	3–11–11–15 (22)	POORLY GRADED SAND w/CLAY, (SP–SC), light brown to beige, moist to wet, medium dense, fine grained. Some clay present in upper 0.4'.	9	
		S–8	1.4	3–8–7–8 (15)	UPPER 1.2' POORLY GRADED SAND w/CLAY, (SP–SC), similar to S–6. LOWER 0.2' CLAYEY SAND, (SC), beige to light brown, moist, medium dense, fine grained.	11	
10		S–10	1.5	6–8–10–11 (18)	UPPER 1.0' POORLY GRADED SAND w/CLAY,(SP–SC), beige to light brown, moist, medium dense, fine grained LOWER 0.5' POORLY GRADED SAND, (SP),light brown,wet, medium dense,fine grained.	15	
					End of boring @ 14' Sampled to 12' Screen interval 7–12'		Stop drilling @ 1345

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-MW5	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 4.4 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.44 (FT. MSL) 06/17/91 START 05/16/91 FINISH 05/16/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	HEADSPACE READINGS (PPM)	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.6	1-2-2-4 (4)	UPPER 0.4' ORGANIC SOIL w/SILT, (OL), LOWER 1.2' SILT, (ML), light brown to tan, moist, soft.	120	Start drilling @ 1613
		S-2	1.8	4-5-7-8 (12)	SILT, (ML), tan to light gray to light brown, moist, stiff.	>1000	
5		S-4	1.6	4-5-6-9 (11)	CLAYEY SAND, (SC), light gray to tan to light brown, moist, stiff, fine grained.	740	
		S-6	1.8	4-7-9-9 (16)	UPPER 0.5' CLAYEY SAND, (SC), similar to S-4 LOWER 1.3' CLAYEY SAND, (SC), light gray to tan to beige, wet to moist, medium dense, fine grained.	450	
		S-8	1.7	1-4-3-4 (7)	UPPER 1.2' CLAYEY SAND, (SC), tan to beige, wet, medium dense, fine grained. LOWER 0.5' CLAYEY SAND, (SC), light gray to beige to light tan, moist, firm.	400	
10		S-10	1.7	1-1-2-2 (3)	CLAYEY SAND, (SC), similar to S-8, soft, less sand @ 11.8-12.0'.	400	
		S-12	1.7	3-9-10-7 (19)	UPPER 0.5' CLAYEY SAND, (SC), tan to beige, wet, medium dense, fine grained LOWER 1.2' POORLY GRADED SAND w/CLAY, (SP-SC), beige to light brown, medium dense, fine grained.	40	Stop drilling @ 1652 Decon more spoons Start drilling @ 1703
15		S-14	0.7	3-6-6-8 (12)	POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-12.	200	
		S-16	0.7	8-7-4-6 (11)	POORLY GRADED SAND, (SP), beige to light gray to tan, wet, medium dense, fine to medium grained.	20	
		S-18	0.4	4-7-7-6 (14)	POORLY GRADED SAND w/SILT, (SP-SM), white to beige to light tan, wet, medium dense, fine to medium grained.	16	
20					End of boring @ 20' Sampled to 20' Screened interval 12.2-17.2'		Stop drilling @ 1805

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2-MW2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 7.6 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 4.63 (FT. MSL) 06/17/91 START 05/20/91 FINISH 05/20/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	0.8	2-7-9-4 (16)	UPPER 0.6' ORGANIC SOIL w/SILTY SAND, (OL), tan to dark brown, moist to wet,medium dense, fine grained.LOWER 0.2' SILTY SAND, (SM), tan to brown, moist, medium dense, fine grained.	8	Start drilling @ 0900
		S-2	1.6	4-7-6-9 (13)	SILT w/SAND, (ML), tan to brown, moist, stiff, clay stringer @ 3.7'.	700	
5		S-4	1.7	3-5-8-15 (13)	UPPER 1.4' SILTY SAND,(SM),tan to beige, moist to wet, medium dense, fine grained LOWER 0.3' POORLY GRADED SAND w/SILT,(SP-SM),beige to brown,moist to wet, medium dense, fine grained.	>1000	
		S-6	1.8	6-6-4-7 (10)	POORLY GRADED SAND w/SILT, (SP-SC), beige to light brown to light tan, wet, loose dense, fine grained.	>1000	
		S-8	1.9	2-2-2-4 (4)	UPPER 0.5' and LOWER 0.4' POORLY GRADED SAND w/CLAY, (SP-SC), light tan to beige, wet, very loose,fine grained MIDDLE 1.0' CLAYEY SAND, (SC), beige to tan, wet, very loose, fine grained.	100	
10		S-10	1.1	2-3-3-4 (6)	POORLY GRADED SAND w/CLAY, (SP-SC), light tan to beige to light brown, wet, loose dense, fine grained, tip is gray.	100	
					End of boring @ 13.5' Sampled to 12' Screen interval 6-11'		Stop drilling @ 0940

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	SHEET
MGM27963.AO.FW	S2-MW3	1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 4.3 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.79 (FT. MSL) 06/17/91 START 05/17/91 FINISH 05/17/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.1	2-2-4-4 (6)	UPPER 0.4' ORGANIC SOIL w/SILT, (OL), dark brown, moist LOWER 0.7' SILT, (ML), tan to brown, moist, firm.	0	Start drilling @ 1330
		S-2	1.2	2-4-4-7 (8)	UPPER 0.7' SILT, (ML), similar to S-0 LOWER 0.5' CLAYEY SAND, (SC), light gray to tan to light brown, moist, firm.	2	
5		ST-4	1.1	-	CLAYEY SAND, (SC), similar to S-2 sandy in lower 0.5'.	-	
		S-6	1.5	5-7-8-6 (15)	POORLY GRADED SAND w/SILT, (SP-SM), light gray, moist to wet, medium dense, fine grained.	100	
		S-8	2.0	3-4-5-7 (9)	UPPER 1.3'POORLY GRADED SAND w/CLAY, (SP-SC),beige to tan, wet, loose dense, fine grained LOWER 0.7' POORLY GRADED SAND w/SILT, (SP-SM),light gray, wet, loose dense, fine grained.	260	
10		S-10	1.5	16-19-17-15 (36)	POORLY GRADED SAND, (SP), beige to light tan, wet, medium dense, fine grained.	100	
		S-12	2.0	26-26-16-27 (42)	POORLY GRADED SAND, (SP), light brown, wet, dense, fine to medium grained.	420	
15					End of boring @ 16' Sampled to 14' Screened interval 8.5-13.5'		Stop drilling @ 1500

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S2–MW4	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 3.6 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING–TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.89 (FT. MSL) 06/17/91 START 05/17/91 FINISH 05/17/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S–0	0.8	2–2–2–2 (4)	ORGANIC SOIL w/SILT, (OL), dark brown, moist, soft, red brick @ 0.5–0.8'.	100	Start drilling @ 0930
		S–2	1.5	1–1–1–1 (2)	UPPER 0.7' ORGANIC SOIL w/WOOD CHIPS, (OL), LOWER 0.8' SILTY SAND, (SM), light gray to gray, moist to wet, fine grained.	>1000	
5		S–4	1.6	WOH–4–10–10 (14)	UPPER 0.8' SILT w/SAND, (ML), dark gray, wet, very soft LOWER 0.8' POORLY GRADED SAND w/SILT, (SP–SM), light gray, wet, medium dense, fine grained.	500	
		S–6	0.4	4–2–2–2 (4)	POORLY GRADED SAND w/SILT, (SP–SM), similar to S–4, very loose.	440	
		S–8	1.7	2–9–13–16 (22)	POORLY GRADED SAND w/SILT, (SP–SM), beige to light tan to light gray, wet, medium dense, fine grained.	460	
10		S–10	2.0	8–11–14–14 (25)	UPPER 1.7' POORLY GRADED SAND w/SILT,(SP–SM),similar to S–8 LOWER 0.3' POORLY GRADED SAND, (SP) beige to light tan, wet, medium dense, fine grained, quartz pebbles present.	260	
		S–12	2.0	13–19–16–19 (35)	POORLY GRADED SAND, (SP), similar to S–10, dense.	780	
15					End of boring @ 16' Sampled to 14' Screened interval 8.5–13.5'		Stop drilling @ 1100

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.A0.FW	BKGD-MW2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 6.4 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 1.83 (FT. MSL) 06/17/91 START 05/16/91 FINISH 05/16/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.5	1-3-2-2 (5)	UPPER 0.5' ORGANIC SOIL w/SILT, (OL), dark brown LOWER 1.0' SILT, (ML), tan to brown, moist, firm.	4	Start drilling @ 0900
		S-2	1.9	2-4-5-7 (9)	SILT w/SAND, (ML), tan to beige to light gray, moist, stiff.	0	
5		S-4	1.9	5-7-9-11 (16)	CLAYEY SAND, (SC), light gray to tan to beige, moist, medium dense, fine grained.	0	
		S-6	1.4	9-7-5-4 (12)	POORLY GRADED SAND w/CLAY, (SP-SC), medium to light tan, moist, medium dense, fine grained.	2	
		S-8	1.5	3-3-4-5 (7)	POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-6, loose dense.	1	
10		S-10	1.2	3-4-5-5 (9)	UPPER 1.0' POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-6 LOWER 0.2' CLAYEY SAND, (SC), beige, moist to wet, stiff.	2	Stop drilling @ 0935 To wait for spoons Start drilling @ 0955
		S-12	0.9	2-2-3-10 (5)	UPPER 0.3' CLAYEY SAND, (SC), beige to light tan, wet, loose dense, fine grained LOWER 0.6' POORLY GRADED SAND w/CLAY, (SP-SC), beige to light tan, medium dense, fine grained.	1	
15		S-14	2.0	WOH-10-6-5 (16)	POORLY GRADED SAND w/CLAY, (SP-SC), similar to S-12, tip is gray sand.	4	
		S-16	2.0	3-4-3-5 (7)	POORLY GRADED SAND w/CLAY, (SP-SC), gray to light gray, wet, loose dense, fine grained, more clay downward.	16	
		S-18	2.0	1-1-3-3 (4)	CLAYEY SAND, (SC), light gray to gray, wet, very loose, fine grained, tip beige and tan.	20	
20		S-20	1.3	WOH-1-3-5 (4)	CLAYEY SAND, (SC), similar to S-18.	20	
		S-22	1.2	3-3-3-4 (6)	POORLY GRADED SAND, (SP), beige to light tan, wet, loose dense, fine grained.	22	Stop drilling @ 1055 To wait for spoons Start drilling @ 1110
25		S-24	2.0	2-2-2-4 (4)	UPPER 0.7' POORLY GRADED SAND, (SP), similar to S-22 LOWER 1.3' POORLY GRADED SAND w/SILT, (SP-SM), beige to white to light tan, wet, very loose, fine grained.	42	
		S-26	1.8	5-4-6-8 (10)	POORLY GRADED SAND, (SP), beige to white to light tan, wet, loose dense, fine grained.	86	
30		S-28	1.7	5-4-4-5 (8)	POORLY GRADED SAND, (SP), similar to S-26, fine to medium grained.	52	Stop drilling @ 1215 End of boring @ 28' Sampled to 30' Screened interval 12-17'

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	S3-PZ1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.8 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 19.28 (FT. MSL) 06/17/91 START 04/30/91 FINISH 04/30/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.8	1-4-3-4 (7)	POORLY GRADED SAND w/SILT, (SP-SM), tan to gray to light gray banding, moist, loose, fine grained.	20	Start drilling @ 1600
		S-2	1.5	2-3-3-5 (6)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-0, wet zone 3.0-4.0'.	2	
5		S-4	1.0	2-2-2-6 (4)	UPPER 0.5' POORLY GRADED SAND w/SILT, (SP-SM), similar to S-0 LOWER 0.5' CLAYEY SAND, (SC), tan to light gray, loose, fine grained.	1	
		S-6	1.2	6-10-11-13 (21)	POORLY GRADED SAND, (SP), light tan, moist, medium dense, medium to fine grained.	3	
		S-8	1.0	3-4-5-6 (9)	POORLY GRADED SAND, (SP), light tan to light gray, wet, loose, fine grained.	3	
10		S-10	1.0	5-5-1-2 (6)	POORLY GRADED SAND, (SP), similar to S-8.	8	
		S-12	1.8	4-5-5-6 (10)	POORLY GRADED SAND, (SP), gray, wet, loose, fine grained.	62	
15					End of boring @ 14' Sampled to 14' Screen interval 8.5'-13.5'		Stop drilling @ 1740

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

PROJECT NUMBER	BORING NUMBER	
MGM27963.A0.FW	S3-PZ2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.9 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 19.62 (FT. MSL) 06/17/91 START 05/01/91 FINISH 05/01/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.8	4-8-8-7 (16)	UPPER 0.8' ORGANIC RICH SHELLS, rich fill material LOWER 1.0' POORLY GRADED SAND w/SILT, (SP-SM), dark brown to black, medium dense, fine grained.	28	Start drilling @ 0815
		S-2	1.5	4-6-6-11 (12)	POORLY GRADED SAND w/SILT, (SP-SM), tan to beige to gray, wet, medium dense, fine grained.	3	
5		S-4	0.8	7-7-8-8 (15)	POORLY GRADED SAND w/CLAY, (SP-SC), beige to tan, medium dense, fine grained.	1	
		S-6	1.2	7-11-13-14 (24)	POORLY GRADED SAND, (SP), beige to tan, upper 0.7' reddish lower 0.5' moist to wet, medium dense, medium to fine grained.	5	
		S-8	1.1	7-6-5-4 (11)	POORLY GRADED SAND w/SILT, (SP-SM), tan/reddish, upper 0.6' gray lower 0.5' wet, medium dense, fine grained.	84	
10					End of boring @ 10' Sampled to 10'		Stop drilling @ 0842

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
MGM27963.AO.FW	BKGD-MW3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT GULFPORT FIELD TRAINING SITE, MISSISSIPPI ANG LOCATION GULFPORT, MISSISSIPPI

ELEVATION 22.9 (FT. MSL) DRILLING CONTRACTOR GEOTECHNICAL ENGINEERING-TESTING, INC.

DRILLING METHOD AND EQUIPMENT CME 750 MODEL ATV RIG, 3.25" I.D. HOLLOW STEM AUGERS

WATER LEVEL AND DATE 19.49 (FT. MSL) 06/17/91 START 05/02/91 FINISH 05/02/91 LOGGER H. UNDERWOOD

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINEROLOGY	HEADSPACE READINGS (PPM)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0		S-0	1.0	4-7-7-7 (14)	POORLY GRADED SAND w/SILT, (SP-SM), tan to beige, moist, medium dense, fine grained.	5	Start drilling @ 0830
		S-2	0.5	2-4-6-4 (10)	POORLY GRADED SAND w/SILT, (SP-SM), tan to beige to light gray, moist, upper 1.0' wet, lower 1.0' loose dense, fine grained.	10	
5		S-4	0.6	2-2-3-5 (5)	UPPER 0.2' POORLY GRADED SAND w/CLAY, (SP-SC), tan to gray, wet, loose, fine grained. LOWER 0.4' CLAYEY SAND, (SC), gray, wet, firm.	4	
		S-6	1.2	4-7-12-7 (19)	POORLY GRADED SAND w/SILT, (SP-SM), gray, wet, medium dense, fine grained.	1	
		S-8	0.9	2-3-3-2 (6)	POORLY GRADED SAND w/SILT, (SP-SM), similar to S-6, loose dense.	1	
10		S-10	0.5	2-4-4-2 (8)	POORLY GRADED SAND w/SILT, (SP-SM), gray to light gray, wet, loose dense, fine grained.	2	
		S-12	2.0	1-4-13-11 (17)	UPPER 1.3' CLAYEY SAND, (SC), gray, wet, medium dense, fine grained LOWER 0.7' POORLY GRADED SAND, (SP), beige to tan, wet, medium dense, fine grained.	3	
15		S-14	0.8	8-6-5-9 (11)	POORLY GRADED SAND, (SP), beige to tan, wet, medium dense, fine to medium grained.	2	
		S-16	1.2	7-4-4-4 (8)	POORLY GRADED SAND w/SILT, (SP-SM), upper 0.4' beige lower 0.4' gray, wet, loose dense, medium to fine grained.	2	
		S-18	1.0	WOH-1-2-1 (3)	LEAN CLAY, (CL), gray, wet, soft.	16	Stop drilling @ 1056 Start drilling @ 1300
20		ST-20	-	-	LEAN CLAY, (CL), similar to S-18.	-	
					End of boring @ 22' Sampled to 22' Screen interval 4.5'-9.5'		Stop drilling @ 1330
25							

NOTE: SOIL DESCRIPTIONS ON THIS LOG ARE A SUMMARY OF FIELD LOGS, VISUAL CLASSIFICATIONS, OR LABORATORY TESTS, IF ANY D1586ACAD

Appendix D
CSL Technical Memorandum

PREPARED FOR: Mississippi Air National Guard
Gulfport Site, Gulfport, Mississippi

PREPARED BY: James Adams/MGM

DATE: November 21, 1991

SUBJECT: Close Support Laboratory Site Investigation
Air National Guard Installation
Restoration Program

PROJECT: MGM27963.A0.FW

Introduction

This Technical Memorandum presents the activities of the Close Support Laboratory (CSL) for the Site Investigation (SI) at the Mississippi Air National, Gulfport Field Training Site (the Base), Gulfport, Mississippi, during May 1991.

This document summarizes procedures, data interpretation guidelines, and results.

Description and Purpose

An onsite CSL was established as part of the SI at the Base to perform screening analysis on soils, sediments, and water samples. The intent of this screening analysis was to provide data of known accuracy to the field team in a timely manner to aid in executing the Sampling and Analysis Plan (SAP).

The CSL screening analysis was part of a larger analytical program discussed previously in the "Sampling Approach and Rationale" section of the SAP. The analytical procedure produced Level B quality data. The screening data were used in guiding the direction of investigation activities and evaluating if contamination migration from a source had occurred. Final recommendations about future remedial activities at each site are based on Level C analytical data generated at a conventional fixed-base laboratory.

Lab Procedures

The analytical methods employed by the CSL were selected and validated for the selected target compounds. The target compounds, which are volatile organics, were selected because the primary sources of suspected contamination are petroleum, oils, and lubricants (POLs) and spent solvents. The target compounds included:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Dichloroethene (total) (DCE)
- Trichloroethene (TCE)
- Tetrachloroethane (PCE)

The following instruments were used for the analysis:

- Gas chromatograph (GC)--Hewlett Packard 5890 Series II GC with temperature programmable oven and Flame Ionization Detection (FID)

- Headspace sampler--Hewlett Packard 19395A Automatic Headspace Sampler

- Integrator--Hewlett Packard 3396 Series II Integrator

The CSL was set up in a trailer at one of the investigation sites.

The Close Support Laboratory methods for analysis of the target compounds for the soil and water headspace/GC-FID are contained in Attachment A.

Data Validation

The CSL data sheets and chromatographs were reviewed for Quality Assurance and Quality Control (QA/QC) of the data.

Data validation began in the field with the review of each chromatograph for anomalies. Anomalous data were annotated on the data summary sheets. For example, quantitatively suspect was used to indicate when data were outside calibration ranges, when peak shapes were unusual, or when spike recoveries and duplicate sample differences were outside the QC ranges established for the CSL. CSL data were reviewed in both the field and the office for data entry and calculation errors.

The data quality was assessed by reviewing log book entries on instrument status and the results of lab and field blanks, standards, and spiked samples.

Instrument calibration was checked daily using low (10 ppb), medium (100 ppb), and high (500 ppb) concentration standards. After calibration, the curves for each target compound were plotted, and the correlation coefficients were calculated. A mid-range standard was analyzed periodically. Lab and field blanks were analyzed to determine if contamination was present in either the instrument or the sampling process.

Quantitative data quality objectives (DQO) included evaluations of relative percent difference (RPD) between duplicate samples and percent recovery (%R) of spiked analytes. Duplicate samples (includes the matrix spike and matrix spike duplicate samples) indicate how consistently the analytical procedure is performing. With the exception of data on May 5, 1991 (first day of analyses), the RPD data met the DQO of less than 30 percent RPD for duplicates.

Spike and spike duplicate samples were used to evaluate the recovery of individual target compounds from both soil and water samples. Recovery data indicate interference with the analysis of contaminants of interest caused by other components of the sample. With the exception of DCE, TCE, and PCE on May 10, 1991, the spike data met the DQO of 60-140 percent recovery.

The CSL data are considered valid as Level B data and meet Level B data quality objectives. A presentation of the blanks, duplicates (RPDs), and matrix spikes (%R) is contained in Attachment B.

Results

CSL data were entered into a LOTUS spreadsheet on a daily basis. The spreadsheet was used to sort the data by site. The CSL results for water and soil samples from the drilling activities are included in Attachment C.

Conclusion

Information provided by the CSL analysis allowed the project manager and field team leaders to make informed decisions about the direction of their work and helped identify when adjustments were warranted.

CSL QC was maintained by adhering to the CSL operating procedures and required QC procedures. The CSL data are valid as Level B data and were used properly to support the field investigation effort.

Appendix A
CSL ANALYTICAL PROCEDURES

CLOSE SUPPORT LABORATORY METHOD FOR ANALYSIS OF:

DICHLOROETHENE (DCE)
TRICHLOROETHENE (TCE)
TETRACHLOROETHENE (PCE)
BENZENE/TOLUENE/ETHYLBENZENE/M- AND O-XYLENE (BTEX)

WATER/HEADSPACE/GC-FID

TARGET CONSTITUENTS

trans 1,2-Dichloroethene
Trichloroethene
Tetrachloroethene
Benzene
Toluene
Ethylbenzene
m-Xylene
o-Xylene

SAMPLE MATRIX

Water

SAMPLE PREPARATION

Headspace Sample

January 21, 1991
mgmCR35/022.51

INSTRUMENTAL/PHYSICAL METHOD

Automated Headspace Sampler/Gas Chromatography

METHOD OF DETECTION

Flame ionization

DETECTION LEVEL

The method detection limits (MDL) for the aromatic target constituents are estimated to be 10 ug/l. The method detection limits for the chlorinated target constituents are estimated to be 40 ug/l. In general, the detection level is a function of sample matrix, sample preparation, and instrument performance.

CLOSE SUPPORT LABORATORY METHOD FOR ANALYSIS OF:

DICHLOROETHENE (DCE)
TRICHLOROETHENE (TCE)
TETRACHLOROETHENE (PCE)
BENZENE/TOLUENE/ETHYLBENZENE/M- AND O-XYLENE (BTEX)

1. SCOPE AND APPLICATION

1.1 This method uses capillary gas chromatography with flame ionization detection (GC/FID) to screen samples for the presence of selected hydrocarbons. The following compounds can be determined by this method.

<u>Hydrocarbons</u>

trans 1,2-Dichloroethylene
Trichloroethylene
Tetrachloroethylene
Benzene
Toluene
Ethylbenzene
m-Xylene
o-Xylene

1.2 Application of this method is limited to the screening analysis of samples for the target parameters. Positive identification and quantification of specific constituents, such as these parameters and other organic pollutants, should be supported by analyses of duplicate and other composited samples at a laboratory employing agency-approved or published testing protocols.

1.3 Preliminary method validation data indicate analysis recoveries of 90 percent.

1.4 The method detection limits (MDL) are estimated to be 10 ug/l for the aromatic target compounds and 40 ug/l for the chlorinated target compounds.

2. SUMMARY OF METHOD

2.1 In brief, a water sample is warmed to 70°C in an oil bath. A sample of the headspace is analyzed on a capillary gas chromatograph using an FID.

3. INTERFERENCES

3.1 Samples containing compounds that co-elute with the target constituents may cause a positive bias in the results.

3.2 The presence of compounds that closely match the retention times of the target constituents may result in false identifications.

3.3 The MDLs for the target constituents may be suppressed by baseline noise associated with samples having high levels of background organics or other interferences.

3.4 The response factors for uncalibrated peaks that are significantly different from those of the target constituents may produce errors in the estimation of the total target constituent contamination.

4. SAFETY

4.1 The target constituents are either identified as or suspected of being **carcinogens. All samples are assumed to be hazardous.** All stock and working calibration standards, as well as all samples, shall be handled with the utmost care using good laboratory techniques in order to avoid harmful exposure.

4.2 Lab analysts shall wear lab coats, safety glasses, and vinyl gloves at all times when preparing and handling standards, field samples, and lab samples.

4.3 Standards and samples shall be prepared in a fume hood.

4.4 All of the target compounds are reported in the NIOSH manual as having "good warning properties." Any situation which leads to or causes noticeable odors or produces any physical symptoms in the workers shall be investigated immediately followed by appropriate corrective action.

Methanol (CH_3OH) is regulated by NIOSH. The suggested Threshold Limit Value (TLV) is 200 ppm, and the Permissable Exposure Level (8-hour PEL) is 200 ppm. Exposure pathways are oral, dermal, and airway. Exposure is harmful and may be fatal. Effects of overexposure include: headache, blindness, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression, gastrointestinal irritation, and hearing loss. The odor threshold of Methanol is reported unavailable. Methanol is highly flammable and is incompatible with active metals and strong alkaline solutions.

4.5 Safety equipment including a fire extinguisher, first aid kit, and eye wash shall be available for use at all times.

4.6 No hazardous lab wastes will be generated by the analysis performed. Because the field samples are unmodified by the addition of solvents, other than water, the laboratory samples will be disposed of in the same manner as excess field samples. Disposable glassware will come in contact only with site soils and dilution water, will be considered non-hazardous, and will be disposed of as trash in containers provided by the facility.

5. APPARATUS AND MATERIALS

5.1 Water sampling equipment--described in "Field Sampling Plan."

5.2 Glassware--class A volumetric pipets and flasks; beakers, vials, pasteur pipets, and miscellaneous glassware as necessary for preparation and handling of samples and standards.

5.3 Labware--necessary for preparation and handling of samples and standards.

5.4 Syringes--Hamilton glass type as required for injection of sample extracts and standards, preparation of dilutions, and spiking of samples.

5.5 Gas chromatograph (GC)--Hewlett Packard 5890 Series II GC with temperature programmable oven operated from 40°C to 125°C with a 530uM 30M SPB-1 3uM capillary column, packed column inlet, and FID.

5.6 Headspace sampler--Hewlett Packard 19395A Automatic Headspace Sampler operated at 70°C.

5.7 Integrator--Hewlett Packard 3396 Series II Integrator.

5.8 Laboratory fume hood, absorbing type is acceptable.

5.9 Top-loading analytical balance to 10 mg.

6.0 CHEMICALS, REAGENTS, AND GASES

6.1 Stock standards--prepare or purchase standard materials at approximately 200 mg/l in methanol.

6.2 Working standards--prepared from stock standards by precise dilution in water.

6.3 Zero Grade Air (<0.1 ppm hydrocarbons) synthetic mix of nitrogen and oxygen--not suitable for use as breathing air.

6.4 UPC Grade Helium--for use as carrier gas.

6.5 UHP Grade Hydrogen.

7. CALIBRATION

7.1 Calibration--three-level calibration at approximately 500, 100, and 10 ug/l for the target constituents in water.

7.2 Working calibration--working calibration shall be verified with the analysis of each working day's lot of samples. Working calibration shall be verified by use of a mid-range standard mix. If the response factors vary by more than ±20 percent for three or more components or the retention times vary by more than ±15 percent and ±0.15 minutes, then recalibration shall be performed on freshly prepared working standards.

7.3 Calibration Criteria--A linear least squares plot, not forced through the origin, shall yield a correlation coefficient of 0.990 or greater for each target constituent.

8. SAMPLE PREPARATION AND EXTRACTION

8.1 Accurately measure 10 ml of sample water into a headspace vial.

8.2 Mix well manually. Place the vial into the headspace sampler's oil bath and equilibrate for a minimum of 30 minutes.

8.3 Using the following headspace conditions transfer the headspace aliquot onto the GC.

Probe down	001
Pressure on	003
Pressure off	013
Vent on	014
Vent off	019
Inject on	020
Inject off	030
Probe up	031
Oil Bath	70°C
Transfer line	75°C
Equilibration	30 minutes
Remote	On
Carrier	12 ml/min
Aux	1.2 Bar
Servo	3.2 Bar
Injection/vial	1

8.4 If the sample is obviously contaminated and experience has shown similar extracts to contain high levels of contamination, it is recommended that a dilution of the sample be made with organic free water to avoid grossly contaminating the gas chromatograph. Samples that appear contaminated should be followed with a lab water sample to minimize carryover. Carryover from the headspace sampler is estimated to be 0.5%.

9. ANALYSIS

9.1 Perform GC analysis on the extract using the instrument conditions similar to those listed in Attachment 1.

9.2 If the analysis indicates that the results are more than 100 percent above the calibration range, prepare a smaller sample amount to yield concentrations that fall within the calibration range. Samples that are still above the calibration range after diluting 1:100 shall be reported as greater than values.

9.3 Check the retention times for each of the reference peaks against the expected (calibration) value. Reject those results where the retention time does not fall with ±5% of the expected value.

10. CALCULATIONS

10.1 Quantification of the target compounds is based on the integrated areas of the samples in comparison to the integrated areas of the calibration standards for each analysis. The integrator reports the concentrations in ppb in the extracts. Calculation of the concentration for each target constituent in the original sample is as follows:

$$\text{Conc. in ug/l} = \frac{A \times Vt}{Vs}$$

Where:

A = Amount of target constituent found in in the headspace in ug/l

Vt = Total volume in the headspace vial in ml (Section 8.1)

Vs = Volume of the sample in ml (Section 8.1 and 9.2)

11. QUALITY ASSURANCE

11.1 Quality assurance measures shall include as a minimum:

- Daily midpoint calibration performed before the analysis of each day's samples.

- Analysis of laboratory blank samples before and after calibration and calibration check samples. Should the results of the laboratory blanks show contamination, the cause of the contamination should be investigated and corrective action taken.

- Analysis of field duplicate samples at a frequency of one in 20 samples or 1/day, whichever is more frequent.

- Analysis of a mid-range matrix spike sample before beginning analysis of any given matrix.

ATTACHMENT 1

* LIST: METH GULFPORT @

RUN PARAMETERS
ZERO = 5
ATT 2^ = 0
CHT SP = 0.5
AR REJ = 100
THRSH = 0
PK WD = 0.04

TIMETABLE EVENTS
0.010 INTG # = 9
1.500 INTG # = -9
15.500 INTG # = 9

CALIBRATION
ESTD
REF % RTW: 5.000 NON-REF % RTW: 5.000

LEVEL: 1 RECALIBRATIONS: 1
LEVEL: 2 RECALIBRATIONS: 1
LEVEL: 3 RECALIBRATIONS: 1

CAL#	RT	LV	AMT	AMT/AREA
1	2.665	1	4.1800E+01	8.2527E-03
		2	4.1800E+02	7.4307E-03
		3	2.0900E+03	7.0054E-03
2R	5.273	1	1.0000E+01	2.2366E-03
		2	9.9400E+01	2.1727E-03
		3	4.9700E+02	2.1499E-03
3	6.659	1	4.9000E+01	9.3942E-03
		2	4.9000E+02	8.8405E-03
		3	2.4500E+03	8.3115E-03
4	9.598	1	1.0000E+01	2.2396E-03
		2	9.9600E+01	2.0946E-03
		3	4.9800E+02	2.0365E-03
5	11.605	1	5.7400E+01	1.0203E-02
		2	5.7400E+02	9.5847E-03
		3	2.8700E+03	8.7250E-03
6	13.772	1	9.0000E+00	2.1547E-03
		2	9.0000E+01	2.2828E-03
		3	4.5000E+02	1.7387E-03
7	14.163	1	9.4000E+00	2.0801E-03
		2	9.4000E+01	2.0840E-03
		3	4.7000E+02	1.6830E-03
8	15.150	1	9.0000E+00	2.6347E-03
		2	9.0000E+01	2.1486E-03
		3	4.5000E+02	2.0517E-03

CAL#	NAME
1	DCE
2	BENZENE
3	TCE
4	TOLUENE
5	PCE
6	E.BENZENE
7	M-XYLENE
8	O-XYLENE

INTEGRATION PLOT TYPE .... FILTERED
Presentation plot .... NO

RUN DATA STORAGE
Store signal data .... NO

Store processed peaks .... NO

CALIBRATION OPTIONS
RF of uncalibrated peaks 2.0000E-05
Calibration fit L
Disable post-run RT update .. NO
SAMPLE AMT .... 0.0000E+00
MUL FACTOR .... 1.0000E+00

REPORT OPTIONS
Suppress local report .... NO
HEIGHT% report .... NO
Report title:
GULFPORT FIELD GULFPORT, MISSANG
Amount label .... PPB
Report uncalibrated peaks ... YES
Extended report .... YES

PRINT & POST-RUN LIST OPTIONS
Large font .... YES
Store post-run report .... NO
External post-run report .... NO
List run parameters .... NO
List timetable .... NO
List calibration table ...... NO
List remote method .... NO
Form-feed before report ..... NO
Form-feed after report ...... YES
Skip perforations in report . YES
Skip perforations in plot ... NO

INET CONFIGURATION

ENTRY	MODEL	ADDR	DATA PATH	STATUS
1	3396B	0	C1 CONS CH 0	ACTIVE
2	5890A	8	C1 PROD CH 0	ACTIVE
3	5890A	8	C1 PROD CH 1	IDLE
4	3396B	0	K0 PROD CH 0	ACTIVE
5	5890A	8	K0 CONS CH 0	ACTIVE

HP 5890A GAS CHROMATOGRAPH
LOOP ADDRESS: 8

OVEN TEMP = 40 SETPT = 40
EQUIB TIME = 1.00 CRYO OFF
OVEN MAXIMUM = 250 CRYO BLAST OFF
INITIAL TEMP = 40
INITIAL TIME = 4.00

TEMP PRGM:	RATE	FINAL TEMP	FINAL TIME
	4.0	85	0.00
RAMP A	20.0	120	2.00

RUN LENGTH = 19.00 MIN

INJ A TEMP = 42 SETPT = 30 (OFF)
INJ B TEMP = 75 SETPT = 75
DET A TEMP = 50 SETPT = 30 (OFF)
DET B TEMP = 175 SETPT = 175

SIGNAL 1 = B
INET FULL RANGE DATA ON
RANGE = 0
ZERO = 0.0

```
SIGNAL 2 = B
 INET FULL RANGE DATA ON
 RANGE = 0
 ZERO  = 0.0
 ATTN  = 0

DETECTOR A = FID  <OFF>
DETECTOR B = FID  <ON>

PURGE A  = OFF
PURGE B  = OFF

VALVE 1  = OFF
VALVE 2  = OFF

- TIME TABLE IS EMPTY -
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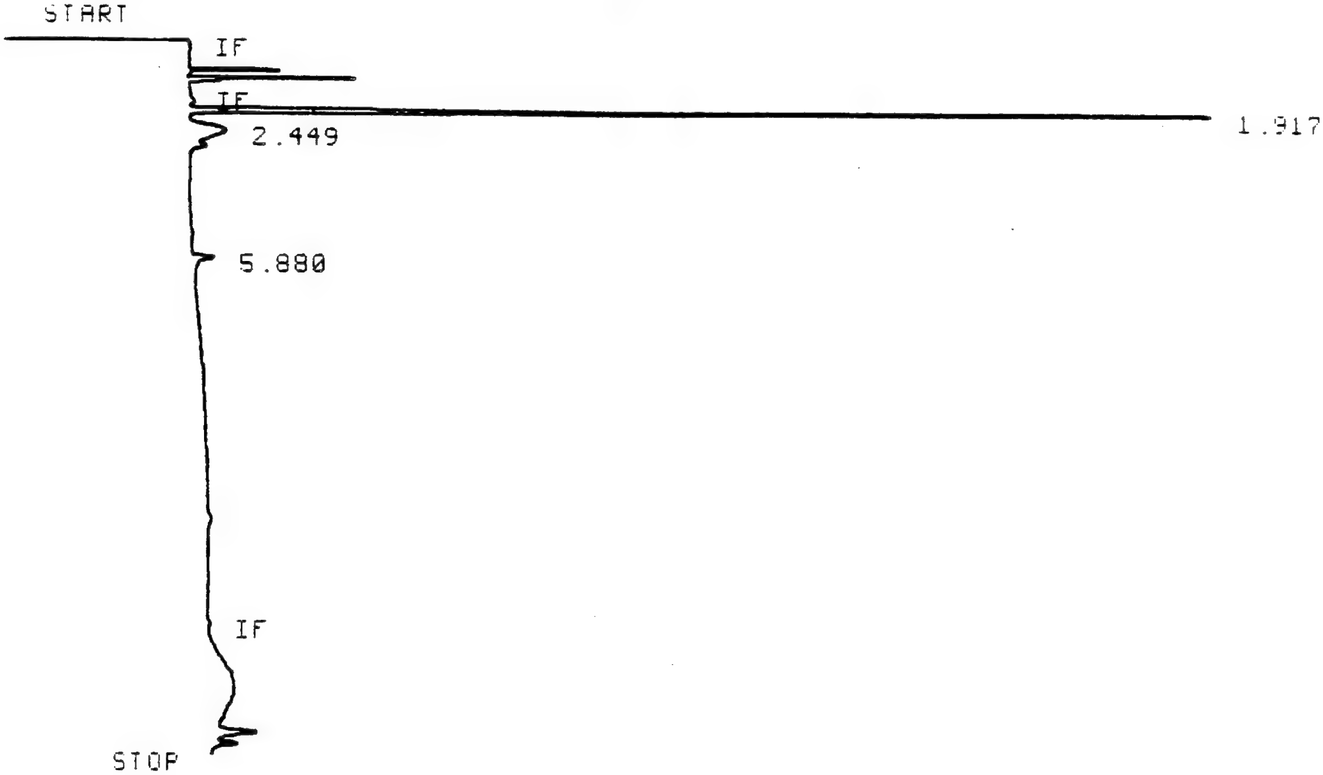


RUN# 144 MAY 14, 1991 09:31:52

GULFPORT FIELD GULFPORT, MISSANG BLANK

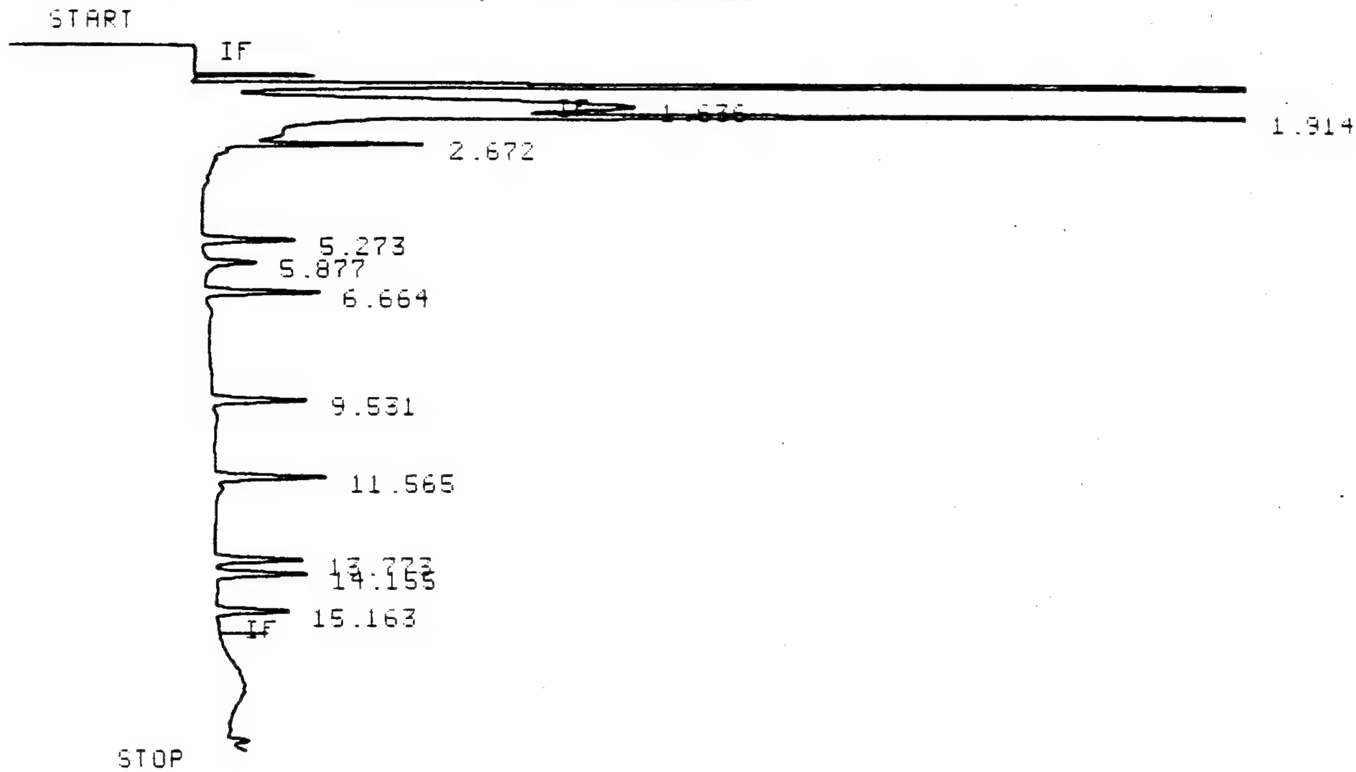
NO CALIB PEAKS FOUND
AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.917	33610	PB	.076	82.53523
2.449	5834	BV	.367	14.32641
5.880	1278	PV	.148	3.13835

TOTAL AREA= 40722
MUL FACTOR=1.0000E+00

RUN # 144-002

* RUN # 145 MAY 14, 1991 09:57:21



RUN# 145 MAY 14, 1991 09:57:21

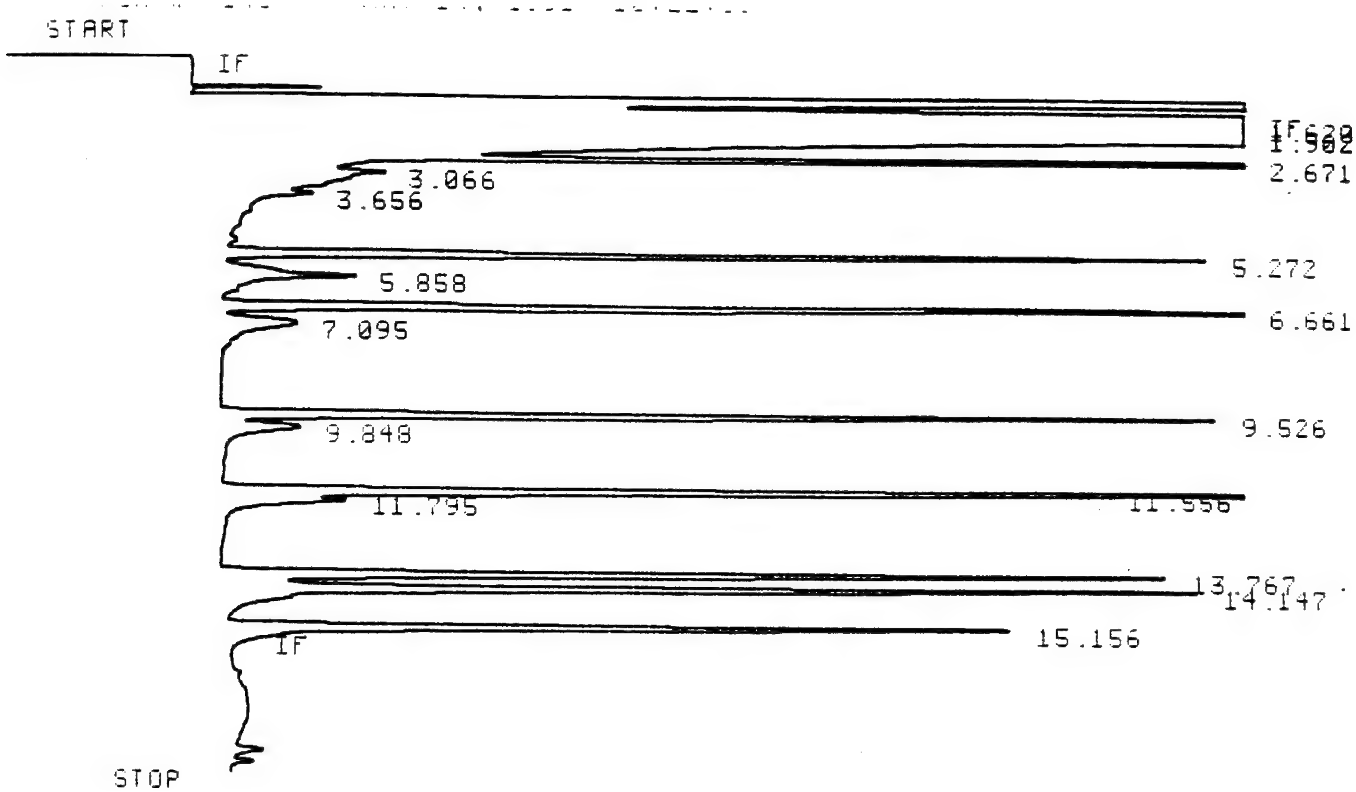
GULFPORT FIELD GULFPORT, MISSANG *Low Std*

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
1.636	BV	14640	.247		29.280	
1.914	VB	42811	.082		85.622	
2.672	VP	6154	.078	1	58.402	DCE
5.273	PV	5180	.128	2R	11.871	BENZENE
5.877	VB	3652	.159		7.304	
6.664	BP	6295	.127	3	69.806	TCE
9.531	PP	5227	.129	4	12.518	TOLUENE
11.565	VV	6755	.140	5	88.716	PCE
13.773	BP	5181	.137	6	20.467	E.BENZENE
14.155	PV	5387	.139	7	18.907	M-XYLENE
15.163	PV	4387	.138	8	12.145	O-XYLENE

TOTAL AREA= 105669
MUL FACTOR=1.0000E+00

RUN # 145-002



RUN# 146 MAY 14, 1991 10:22:59

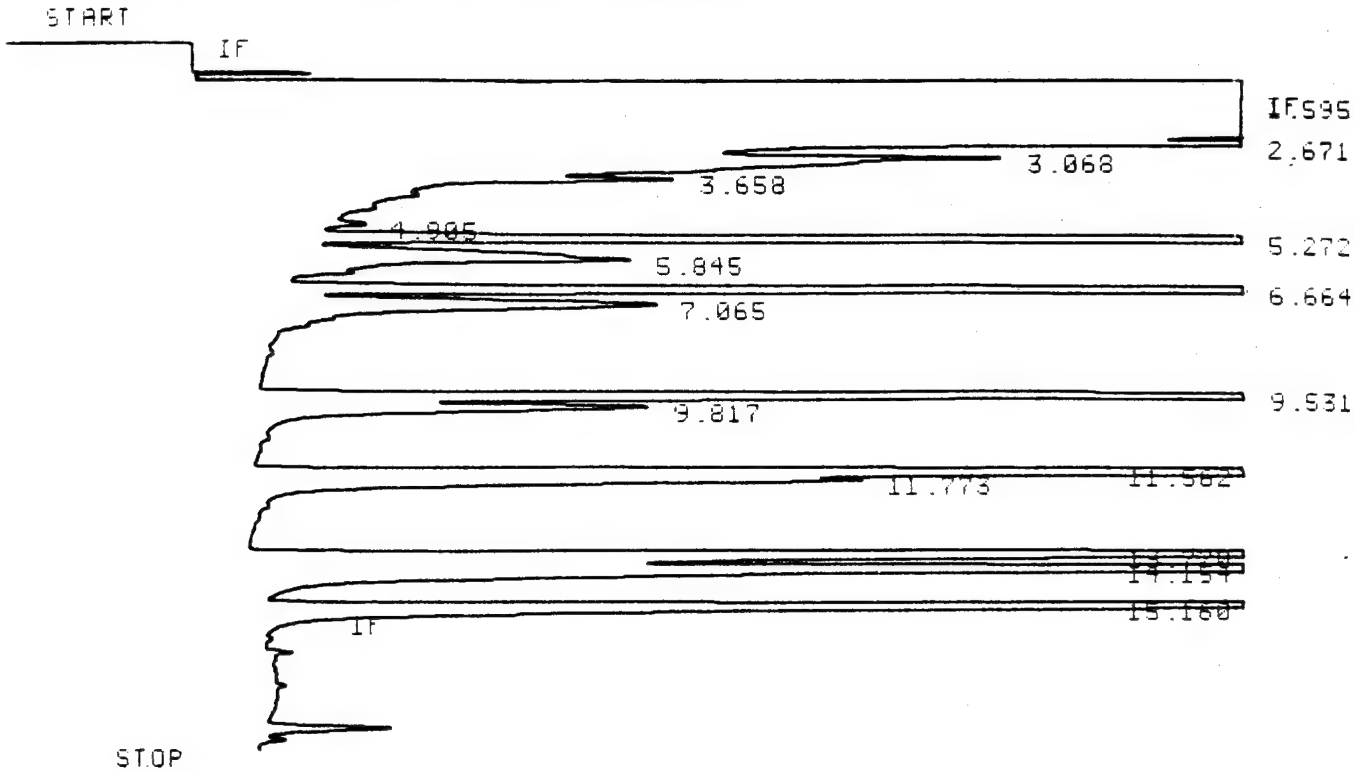
GULFPORT FIELD GULFPORT, MISSANG *Medium Std*

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
1.620	BU	111245	.252		222.490	
2.671	PB	64721	.078	1	462.505	DCE
3.066	BU	7027	.281		14.054	
3.656	UP	925	.065		1.850	
5.272	PP	52846	.125	2R	113.510	BENZENE
5.858	PU	13858	.243		27.716	
6.661	PU	67934	.126	3	574.885	TCE
7.095	UU	12200	.377		24.400	
9.526	PU	57115	.133	4	117.127	TOLUENE
9.848	UU	9862	.291		19.724	
11.556	PU	75438	.142	5	678.171	PCE
11.795	UU	11560	.216		23.120	
13.767	PU	57775	.141	6	109.116	E.BENZENE
14.147	UU	63524	.151	7	114.328	M-XYLENE
15.156	PB	46266	.140	8	96.580	O-XYLENE

TOTAL AREA= 652296
MUL FACTOR=1.0000E+00

RUN # 146-002



RUN# 147 MAY 14, 1991 10:48:26

GULFPORT FIELD GULFPORT, MISSANG High Std

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
2.671	PB	294361	.078	1	2057.827	DCE
3.068	BU	41550	.299		83.100	
3.658	UP	5842	.084		11.684	
4.905	PP	1900	.129		3.800	
5.272	PU	232638	.125	2R	498.497	BENZENE
5.845	UU	47787	.340		95.574	
6.664	PU	305395	.126	3	2530.072	TCE
7.065	UU	51342	.319		102.684	
9.531	PU	251536	.133	4	510.317	TOLUENE
9.817	UU	44263	.263		88.526	
11.562	BU	344796	.143	5	2999.216	PCE
11.773	UU	48783	.186		97.566	
13.770	PU	269922	.150	6	468.176	E.BENZENE
14.154	UB	289988	.159	7	486.524	M-XYLENE
15.160 I	BH	227615	.155	8	466.496	O-XYLENE

TOTAL AREA=2457718
MUL FACTOR=1.0000E+00

RUN # 147-002

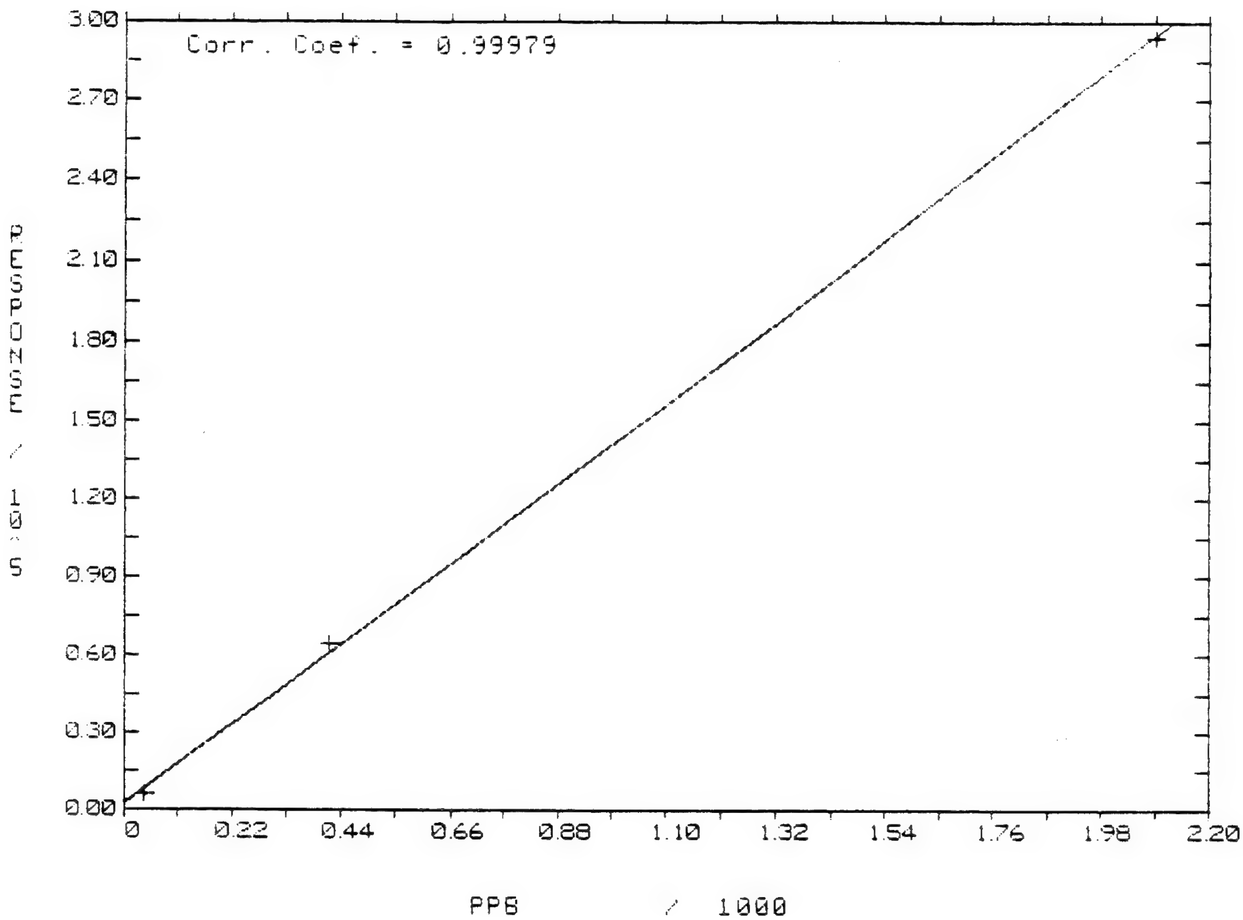
WELCOME TO THE HP3396 CALIBRATION CURVE PLOTTING PROGRAM Rev. 3.01.00

At any prompt: 'Q' [ENTER] Quits
'S' [ENTER] Starts Over

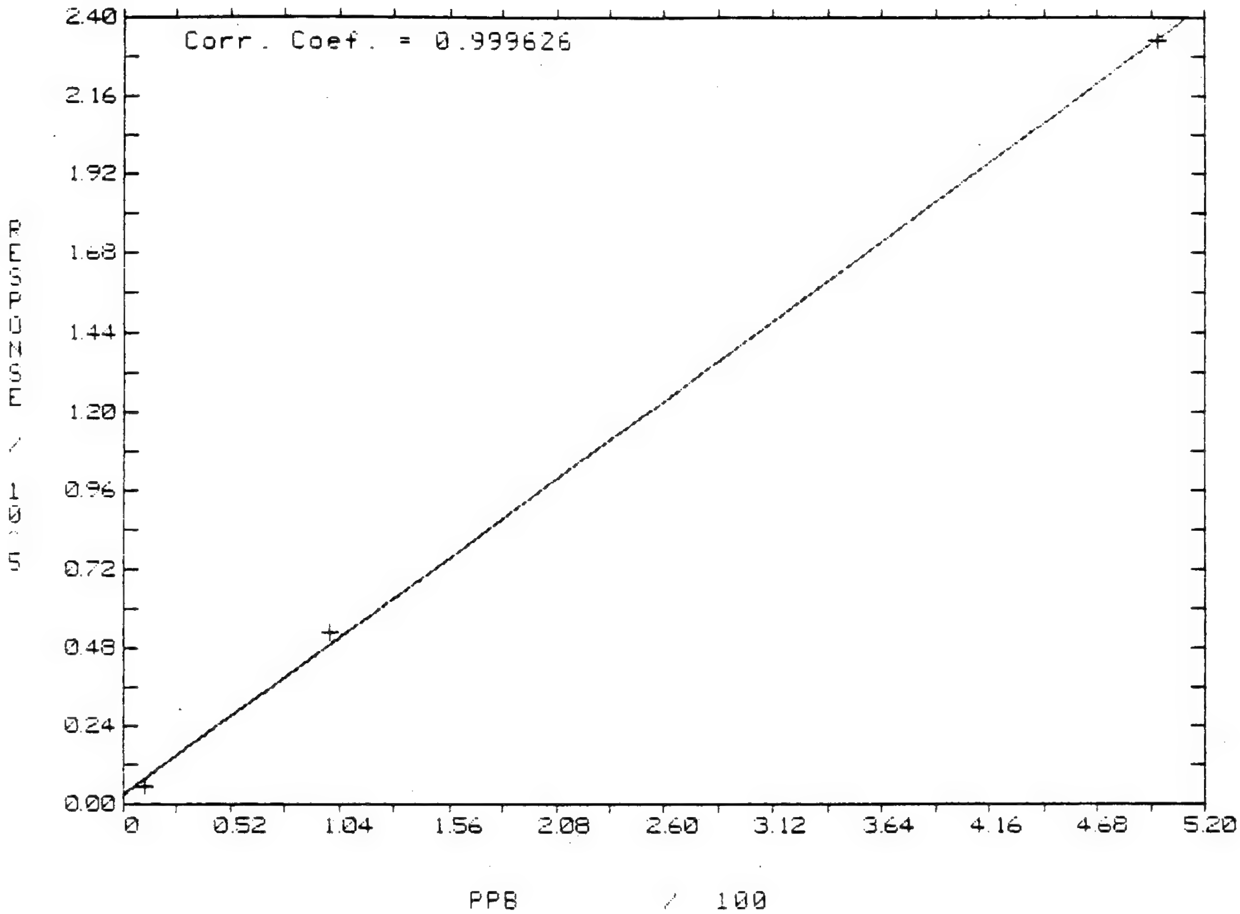
Load which method or calib. file [Current active*]:

Plot the calibration curve for which CAL # [All*]:

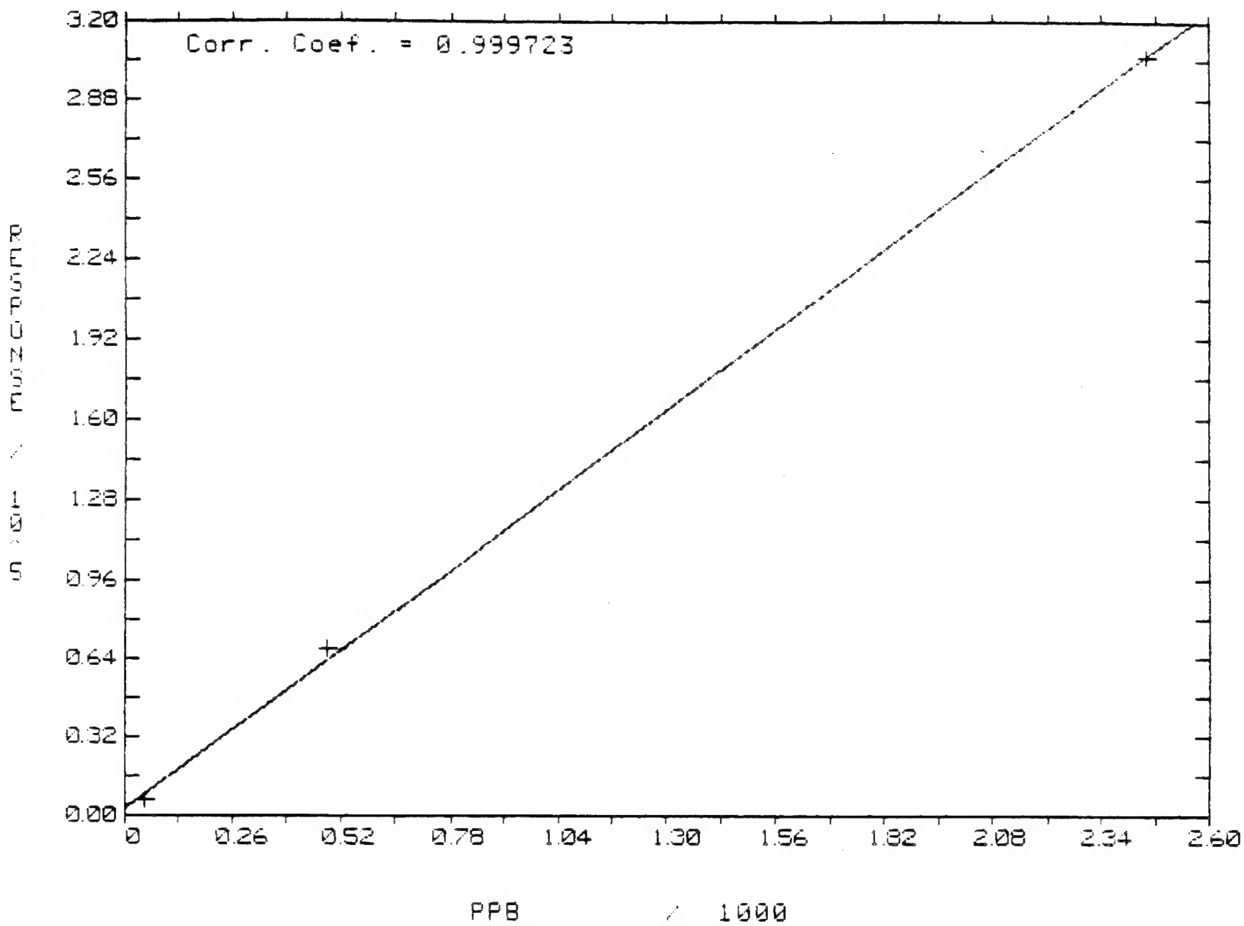
ABSOLUTE Amount vs. Area for Cal # 1
PPB = -2.13E+01 +7.16E-03 (RESPONSE)



ABSOLUTE Amount vs. Area for Cal #
PPB = -7.19E+00 +2.16E-03 (RESPONSE)

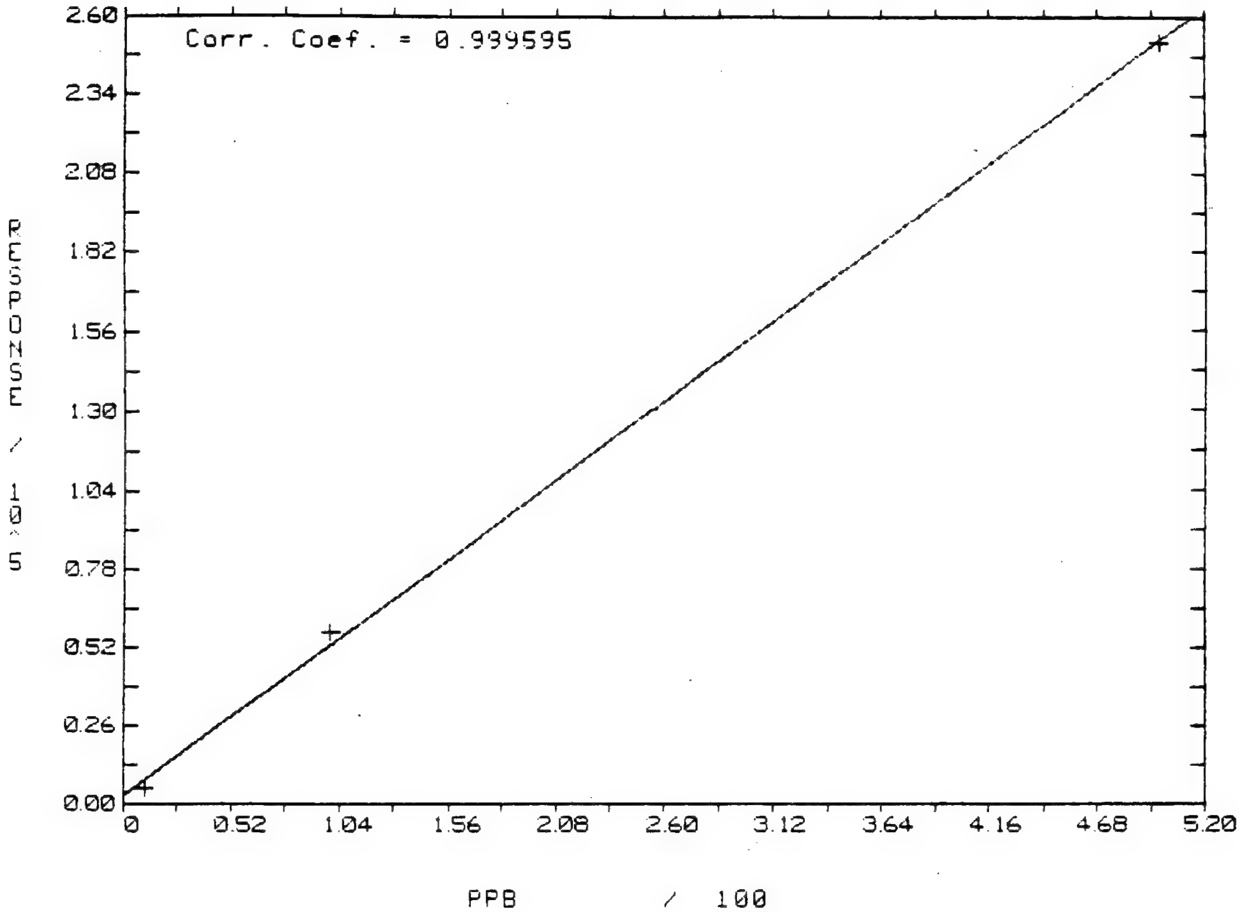


ABSOLUTE Amount vs. Area for Cal # 3
PPB = -2.75E+01 +8.09E-03 (RESPONSE)

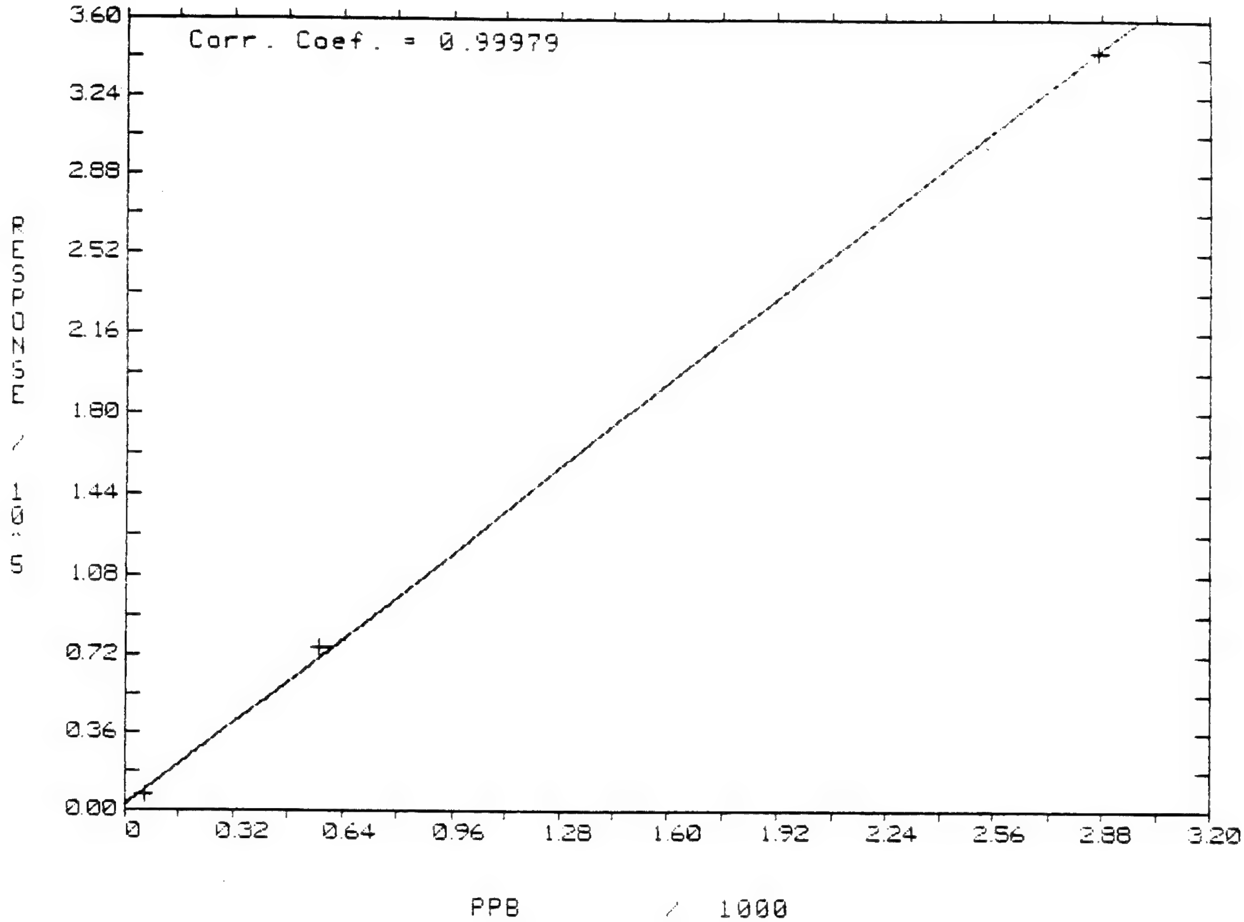


ABSOLUTE Amount vs. Area for Cal # 4

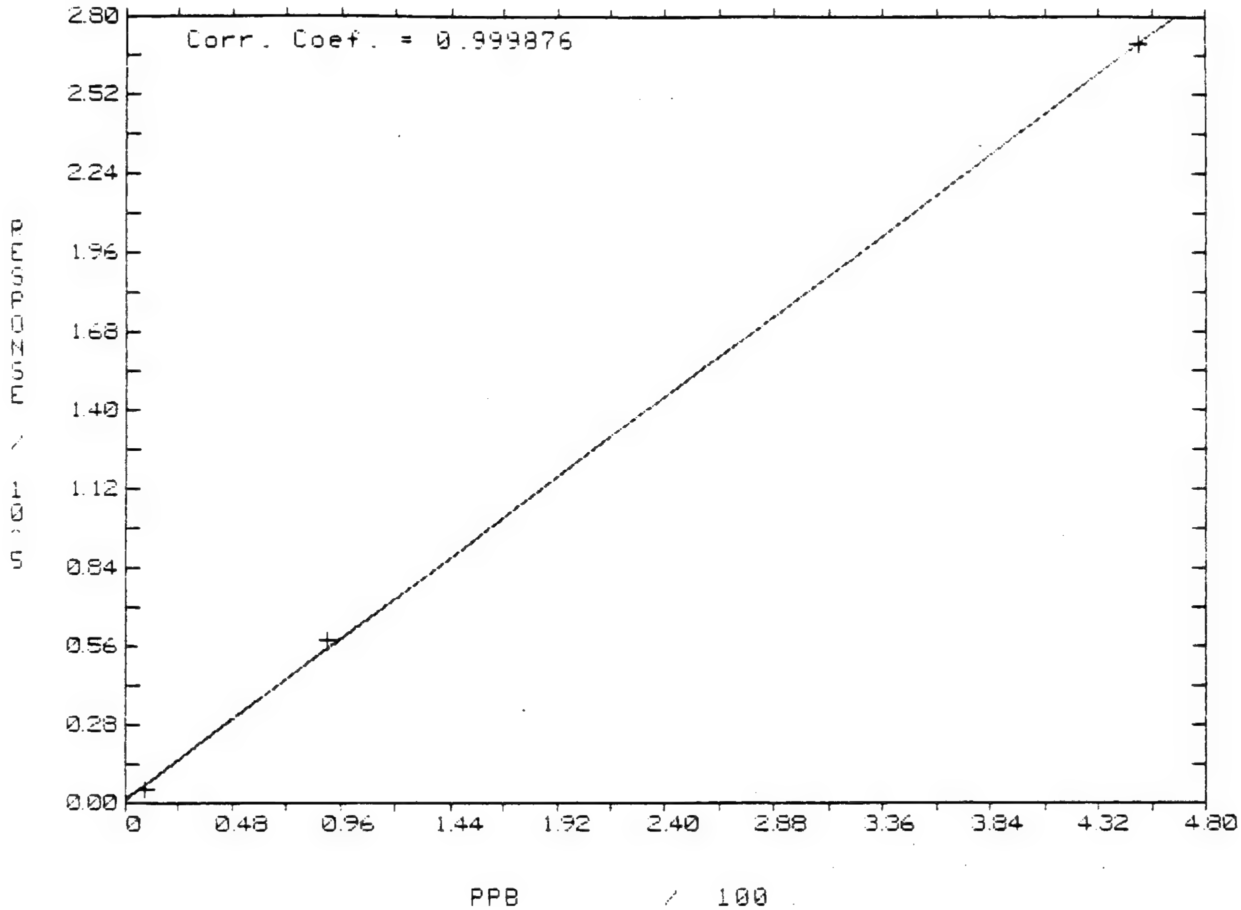
PPB = -6.70E+00 +2.00E-03 (RESPONSE)



ABSOLUTE Amount vs. Area for Cal # 5
PPB = -2.53E+01 +8.38E-03 (RESPONSE)

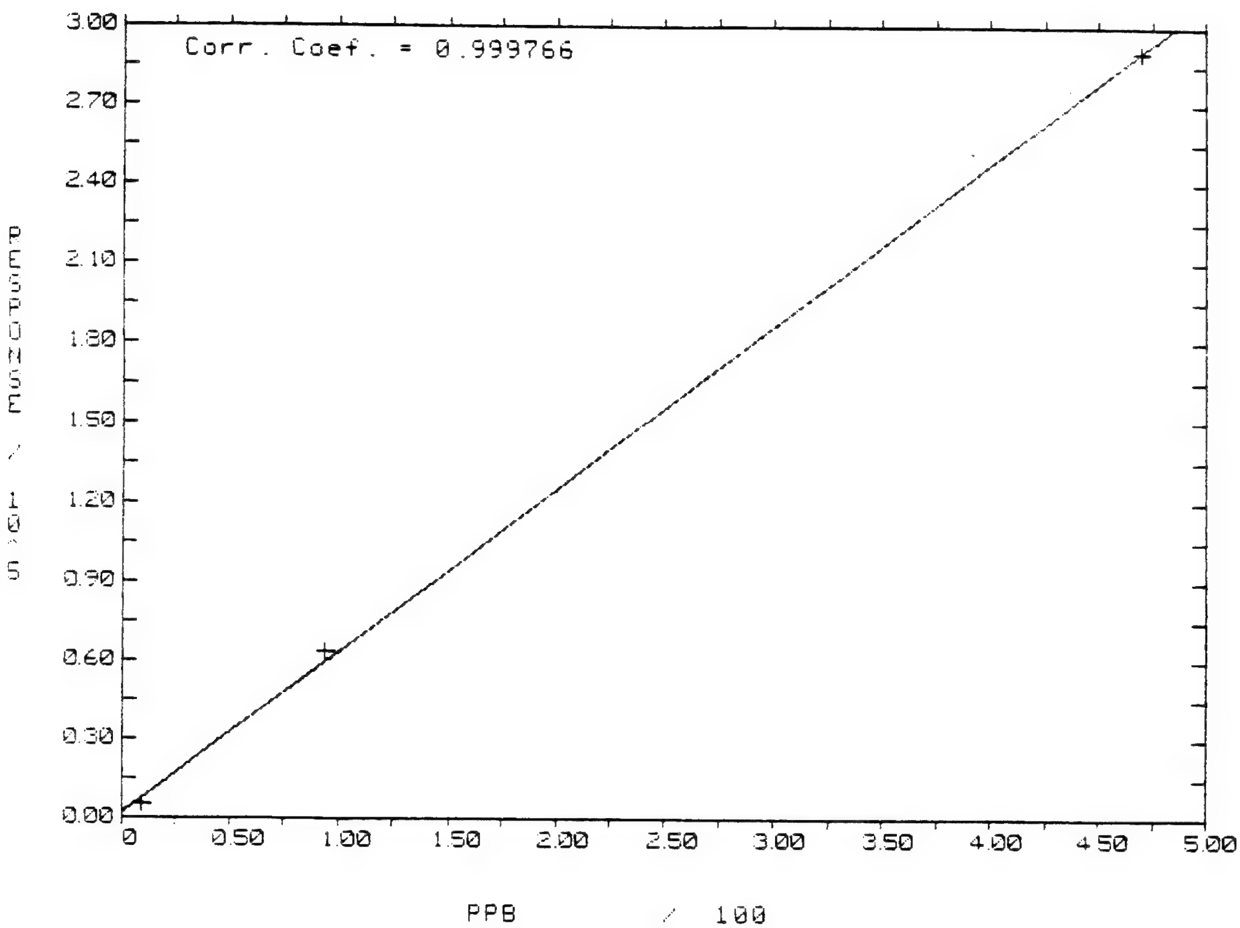


ABSOLUTE Amount vs. Area for Cal # 5
PPB = -2.83E+00 +1.67E-03 (RESPONSE)

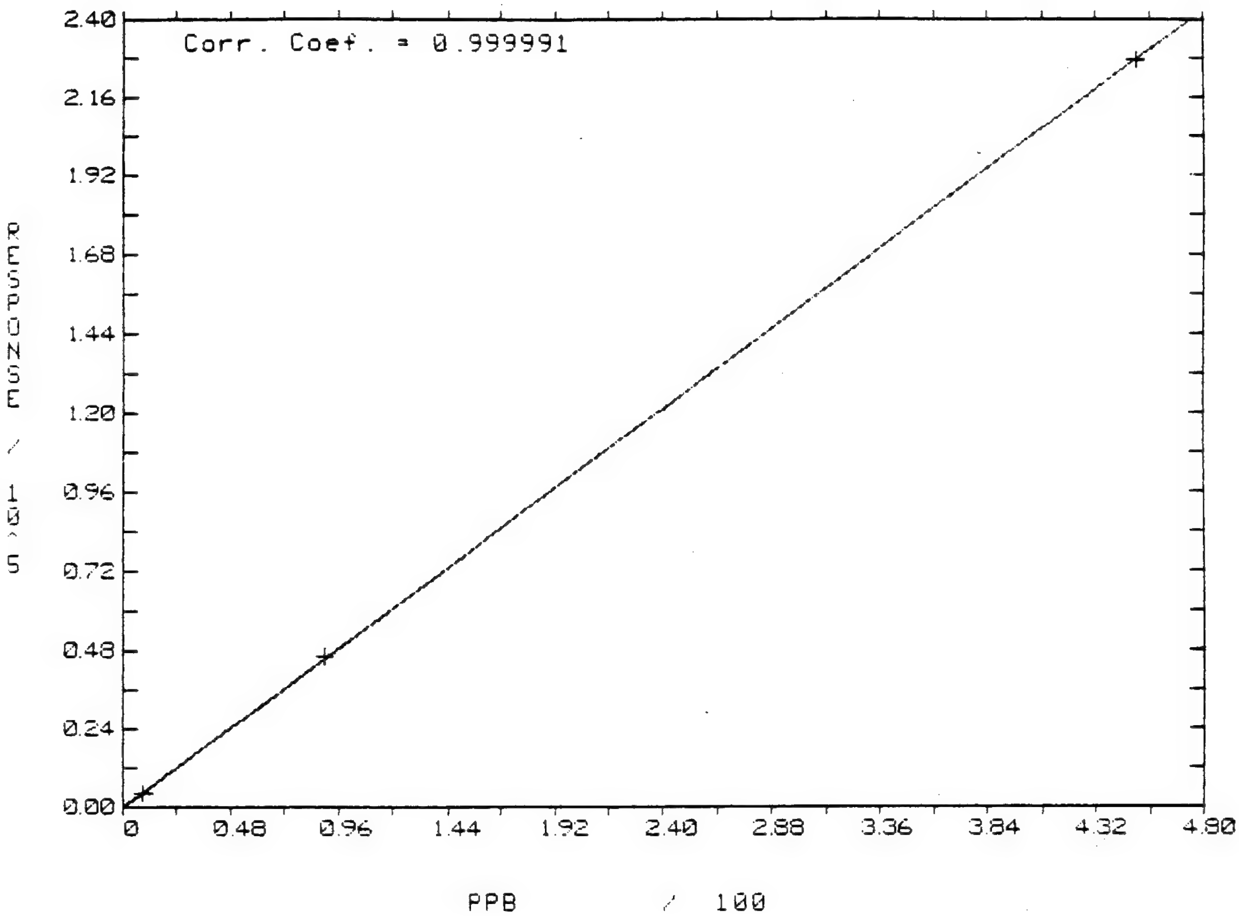


ABSOLUTE Amount vs. Area for Cal # 7

PPB = -3.89E+00 +1.63E-03 (RESPONSE)



ABSOLUTE Amount vs. Area for Cal # 8
PPB = -5.11E-01 +1.98E-03 (RESPONSE)



CLOSE SUPPORT LABORATORY METHOD FOR ANALYSIS OF:

DICHYLOROETHENE (DCE)
TRICHLOROETHENE (TCE)
TETRACHLOROETHENE (PCE)
BENZENE/TOLUENE/ETHYLBENZENE/M- AND O-XYLENE (BTEX)

SOIL/HEADSPACE/GC-FID

TARGET CONSTITUENTS

trans 1,2-DICHLOROETHENE
TRICHLOROETHENE
TETRACHLOROETHENE
BENZENE
TOLUENE
ETHYLBENZENE
m-XYLENE
o-XYLENE

SAMPLE MATRIX

Soil

SAMPLE PREPARATION

Water Extraction/Headspace Sample

CLOSE SUPPORT LABORATORY METHOD FOR ANALYSIS OF:

DICHYLOROETHENE (DCE)
TRICHLOROETHENE (TCE)
TETRACHLOROETHENE (PCE)
BENZENE/TOLUENE/ETHYLBENZENE/M- AND O-XYLENE (BTEX)

1. SCOPE AND APPLICATION

1.1 This method uses capillary gas chromatography with flame ionization detection (GC/FID) to screen samples for the presence of selected hydrocarbons. The following compounds can be determined by this method.

Hydrocarbons

trans 1,2-Dichloroethylene
Trichloroethylene
Tetrachloroethylene
Benzene
Toluene
Ethylbenzene
m-Xylene
o-Xylene

1.2 Application of this method is limited to the screening analysis of samples for the target parameters. Positive identification and quantification of specific constituents, such as these parameters and other organic pollutants, should be supported by analyses of duplicate and other composited samples at a laboratory employing agency-approved or published testing protocols.

1.3 Preliminary method validation data indicate analysis recoveries of 90 percent.

1.4 The method detection limits (MDL) are estimated to be 50 ug/kg for the aromatic target compounds and 200 ug/kg for the chlorinated target compounds.

INSTRUMENTAL/PHYSICAL METHOD

Automated Headspace Sampler/Gas Chromatography

METHOD OF DETECTION

Flame ionization

DETECTION LEVEL

The method detection limits (MDL) for the aromatic target constituents are estimated to be 50 ug/kg. The method detection limits for the chlorinated target constituents are estimated to be 200 ug/kg. In general, the detection level is a function of sample matrix, sample preparation, and instrument performance.

2. SUMMARY OF METHOD

2.1 In brief, soil is shaken in water and warmed to 70°C in an oil bath. A sample of the headspace is analyzed on a capillary gas chromatograph using a flame ionization detector (FID).

3. INTERFERENCES

3.1 Samples containing compounds that co-elute with the target constituents may cause a positive bias in the results.

3.2 The presence of compounds that closely match the retention times of the target constituents may result in false identifications.

3.3 The MDLs for the target constituents may be suppressed by baseline noise associated with samples having high levels of background organics or other interferences.

3.4 The response factors for uncalibrated peaks that are significantly different from those of the target constituents may produce errors in the estimation of the total target constituent contamination.

4. SAFETY

4.1 The target constituents are either identified as or suspected of being **carcinogens. All samples are assumed to be hazardous.** All stock and working calibration standards, as well as all samples, shall be handled with the utmost care using good laboratory techniques in order to avoid harmful exposure.

4.2 Lab analysts shall wear lab coats, safety glasses, and vinyl gloves at all times when preparing and handling standards, field samples, and lab samples.

4.3 Standards and samples shall be prepared in a fume hood.

4.4 All of the target compounds are reported in the NIOSH manual as having "good warning properties." Any situation which leads to or causes noticeable odors or produces any physical symptoms in the workers shall be investigated immediately followed by appropriate corrective action.

Methanol (CH_3OH) is regulated by NIOSH. The suggested Threshold Limit Value (TLV) is 200 ppm, and the Permissable Exposure Level (8-hour PEL) is 200 ppm. Exposure pathways are oral, dermal, and airway. Exposure is harmful and may be fatal. Effects of overexposure include: headache, blindness, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression, gastrointestinal irritation, and hearing loss. The odor threshold of Methanol is reported unavailable. Methanol is highly flammable and is incompatible with active metals and strong alkaline solutions.

4.5 Safety equipment including a fire extinguisher, first aid kit, and eye wash shall be available for use at all times.

4.6 No hazardous lab wastes will be generated by the analysis performed. Because the field samples are unmodified by the addition of solvents, other than water, the laboratory samples will be disposed of in the same manner as excess field samples. Disposable glassware will come in contact only with site soils and dilution water, will be considered non-hazardous, and disposed of as trash in containers provided by the facility.

5. APPARATUS AND MATERIALS

5.1 Soil sampling equipment--described in "Field Sampling Plan."

5.2 Glassware--class A volumetric pipets and flasks; beakers, vials, pasteur pipets, and miscellaneous glassware as necessary for preparation and handling of samples and standards.

5.3 Labware--necessary for preparation and handling of samples and standards.

5.4 Syringes--Hamilton glass type as required for injection of sample extracts and standards, preparation of dilutions, and spiking of samples.

5.5 Gas chromatograph (GC)--Hewlett Packard 5890 Series II GC with temperature programmable oven operated from 40°C to 120°C with a 530uM 30M SPB-1 3uM capillary column, packed column inlet, and FID.

5.6 Headspace sampler--Hewlett Packard 19395A Automatic Headspace Sampler operated at 70°C.

5.7 Integrator--Hewlett Packard 3396 Series II Integrator.

5.8 Laboratory fume hood, absorbing type is acceptable.

5.9 Top-loading analytical balance to 10 mg.

6.0 CHEMICALS, REAGENTS, AND GASES

6.1 Stock standards--prepare or purchase standard materials at approximately 200 mg/l in methanol.

6.2 Working standards--prepared from stock standards by precise dilution in water.

6.3 Zero Grade Air (<0.1 ppm hydrocarbons) synthetic mix of nitrogen and oxygen--not suitable for use as breathing air.

6.4 UPC Grade Helium--for use as carrier gas.

6.5 UHP Grade Hydrogen.

7. CALIBRATION

7.1 Calibration--three-level calibration at approximately 500, 100, and 10 ug/l for the target constituents in water.

7.2 Working calibration--working calibration shall be verified with the analysis of each working day's lot of samples. Working calibration shall be verified by use of a mid-range standard mix. If the response factors vary by more than ±20 percent for three or more components or the retention times vary by more than ±15 percent and ±0.15 minutes, then recalibration shall be performed on freshly prepared working standards.

7.3 Calibration Criteria--A linear least squares plot, not forced through the origin, shall yield a correlation coefficient of 0.990 or greater for each target constituent.

8. SAMPLE PREPARATION AND EXTRACTION

8.1 Accurately weigh approximately 2 g of soil into a headspace vial containing 10 ml of organic-free water.

8.2 Mix well manually for 1 minute. Place the vial into the headspace sampler's oil bath and equilibrate for a minimum of 30 minutes.

8.3 Using the following headspace conditions transfer the headspace aliquot onto the GC.

Probe down	001
Pressure on	003
Pressure off	013
Vent on	014
Vent off	019
Inject on	020
Inject off	030
Probe up	031
Oil Bath	70oC
Transfer line	75oC
Equilibration	30 minutes
Remote	on
Carrier	12 ml/min
Aux	1.2 Bar
Servo	3.2 Bar
Injection/vial	1

8.4 If the sample is obviously contaminated and experience has shown similar extracts to contain high levels of contamination, it is recommended that a smaller amount of soil be prepared to avoid grossly contaminating the gas chromatograph. Samples that appear contaminated should be followed with a lab water sample to minimize carryover. Carryover from the headspace sampler is estimated to be 0.5%.

9. ANALYSIS

9.1 Perform GC analysis on the extract using the instrument conditions similar to those listed in Attachment 1.

9.2 If the analysis indicates that the results are more than 100 percent above the calibration range, prepare a smaller sample amount to yield concentrations that fall within the calibration range. Samples that are still above the calibration range after preparing soil amounts less than 0.1 g shall be reported as greater than values.

9.3 Check the retention times for each of the reference peaks against the expected (calibration) value. Reject those results where the retention time does not fall with ±5% of the expected value.

10. CALCULATIONS

10.1 Quantification of the target compounds is based on the integrated areas of the samples in comparison to the integrated areas of the calibration standards for each analysis. The integrator reports the concentrations in PPB in the extracts. Calculation of the concentration for each target constituent in the original sample is as follows:

$$\text{Conc. in ug/kg} = \frac{A \times Vt}{Ws}$$

Where:

A = Amount of target constituent found in in the headspace in ug/l

Vt = Volume of the water plus soil in liters (Section 8.1 and 9.2)

Ws = Weight of the sample added in kilograms (Section 8.1)

11. QUALITY ASSURANCE

11.1 Quality assurance measures shall include as a minimum:

- Daily midpoint calibration performed before the analysis of each day's samples.
- Analysis of laboratory blank samples before and after calibration and calibration check samples. Should the results of the laboratory blanks show contamination, the cause of the contamination should be investigated and corrective action taken.
- Analysis of field duplicate samples at a frequency of one in 20 samples or 1/day which ever is more frequent.
- Analysis of a mid-range matrix spike sample before beginning analysis of any given matrix.

ATTACHMENT 1

✦ LIST: METH GULFPORT @

RUN PARAMETERS
ZERO = 5
ATT 2^ = 0
CHT SP = 0.5
AR REJ = 100
THRSH = 0
PK WD = 0.04

TIMETABLE EVENTS
0.010 INTG # = 9
1.500 INTG # = -9
15.500 INTG # = 9

CALIBRATION
ESTD
REF % RTW: 5.000 NON-REF % RTW: 5.000

LEVEL: 1 RECALIBRATIONS: 1
LEVEL: 2 RECALIBRATIONS: 1
LEVEL: 3 RECALIBRATIONS: 1

CAL#	RT	LV	AMT	AMT/AREA
1	2.665	1	4.1800E+01	8.2527E-03
		2	4.1800E+02	7.4307E-03
		3	2.0900E+03	7.0054E-03
2R	5.273	1	1.0000E+01	2.2366E-03
		2	9.9400E+01	2.1727E-03
		3	4.9700E+02	2.1499E-03
3	6.659	1	4.9000E+01	9.3942E-03
		2	4.9000E+02	8.8405E-03
		3	2.4500E+03	8.3115E-03
4	9.598	1	1.0000E+01	2.2396E-03
		2	9.9600E+01	2.0946E-03
		3	4.9800E+02	2.0365E-03
5	11.605	1	5.7400E+01	1.0203E-02
		2	5.7400E+02	9.5847E-03
		3	2.8700E+03	8.7250E-03
6	13.772	1	9.0000E+00	2.1547E-03
		2	9.0000E+01	2.2828E-03
		3	4.5000E+02	1.7387E-03
7	14.163	1	9.4000E+00	2.0801E-03
		2	9.4000E+01	2.0840E-03
		3	4.7000E+02	1.6830E-03
8	15.150	1	9.0000E+00	2.6347E-03
		2	9.0000E+01	2.1486E-03
		3	4.5000E+02	2.0517E-03

CAL#	NAME
1	DCE
2	BENZENE
3	TCE
4	TOLUENE
5	PCE
6	E.BENZENE
7	M-XYLENE
8	O-XYLENE

INTEGRATION PLOT TYPE .... FILTERED
Presentation plot .... NO

RUN DATA STORAGE
Store signal data .... NO

```
[illegible] processed peaks ........ [illegible]

CALIBRATION OPTIONS
RF of uncalibrated peaks .... 2.0000E-03
Calibration fit ............. L
Disable post-run RT update .. NO
SAMPLE AMT .................. 0.0000E+00
MUL FACTOR .................. 1.0000E+00

REPORT OPTIONS
Suppress local report ....... NO
HEIGHT% report .............. NO
Report title:
GULFPORT FIELD  GULFPORT, MISSANG
Amount label ................ PPB
Report uncalibrated peaks ... YES
Extended report ............. YES

PRINT & POST-RUN LIST OPTIONS
Large font .................. YES
Store post-run report ....... NO
External post-run report .... NO
List run parameters ......... NO
List timetable .............. NO
List calibration table ...... NO
List remote method .......... NO
Form-feed before report ..... NO
Form-feed after report ...... YES
Skip perforations in report . YES
Skip perforations in plot ... NO

              INET CONFIGURATION
ENTRY  MODEL   ADDR   DATA PATH       STATUS
-----  ------  ----  ------------     ------
  1    3396B     0   C1  CONS CH 0    ACTIVE
  2    5890A     8   C1  PROD CH 0    ACTIVE
  3    5890A     8   C1  PROD CH 1    IDLE

  4    3396B     0   K0  PROD CH 0    ACTIVE
  5    5890A     8   K0  CONS CH 0    ACTIVE


HP 5890A GAS CHROMATOGRAPH
  LOOP ADDRESS: 8

 OVEN TEMP =  40     SETPT =  40
  EQUIB TIME   = 1.00         CRYO OFF
  OVEN MAXIMUM = 250      CRYO BLAST OFF
  INITIAL TEMP =  40
  INITIAL TIME = 4.00

 TEMP PRGM: RATE    FINAL TEMP   FINAL TIME
             4.0        85          0.00
  RAMP A    20.0       120          2.00

 RUN LENGTH = 19.00 MIN

 INJ A TEMP =  42   SETPT =  30  (OFF)
 INJ B TEMP =  75   SETPT =  75
 DET A TEMP =  50   SETPT =  30  (OFF)
 DET B TEMP = 175   SETPT = 175

 SIGNAL 1 = B
  INET FULL RANGE DATA ON
  RANGE = 0
  ZERO  = 0.0
```

```
[illegible]    =  Ø

SIGNAL 2 = B
 INET FULL RANGE DATA ON
 RANGE = Ø
 ZERO  = Ø.Ø
 ATTN  = Ø

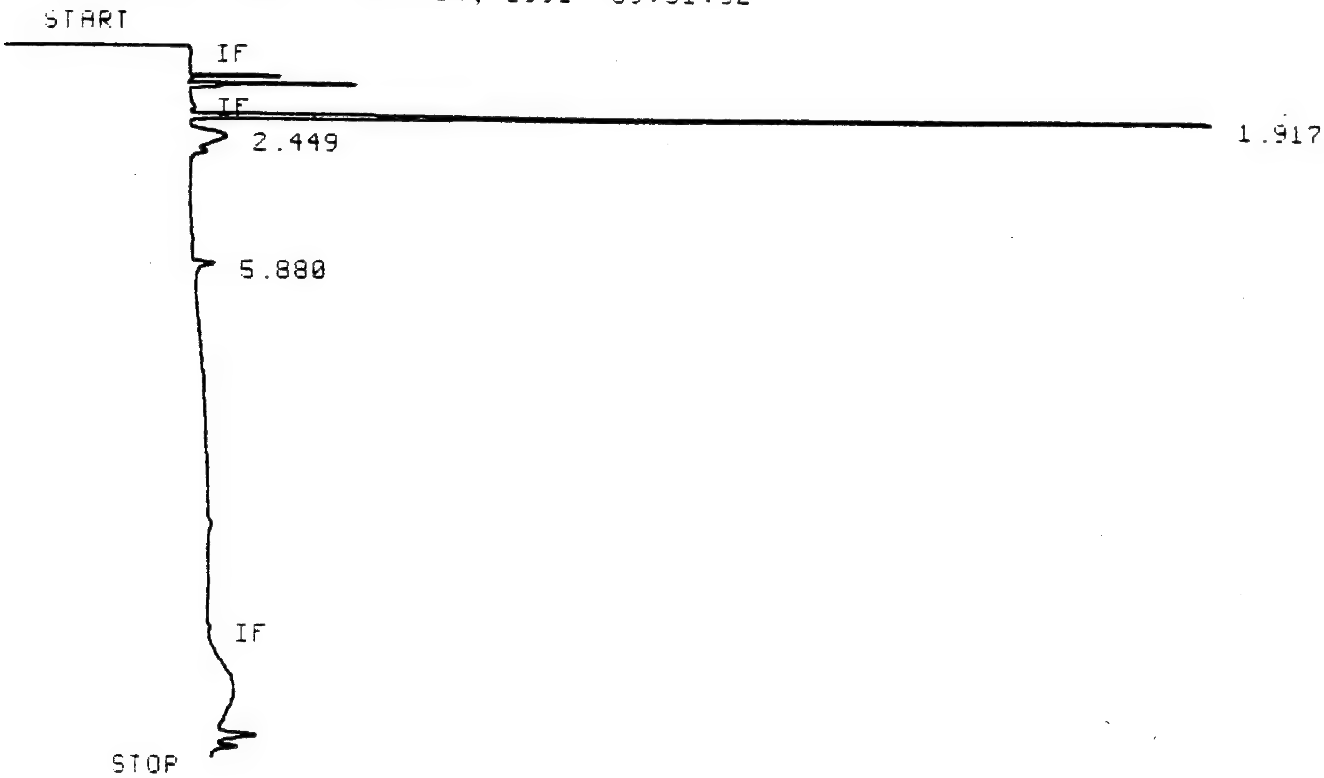
DETECTOR A = FID  <OFF>
DETECTOR B = FID  <ON>

PURGE A   = OFF
PURGE B   = OFF

VALVE 1   = OFF
VALVE 2   = OFF

- TIME TABLE IS EMPTY -
```

+ RUN # 144 MAY 14, 1991 09:31:52



RUN# 144 MAY 14, 1991 09:31:52

GULFPORT FIELD GULFPORT, MISSANG BLANK

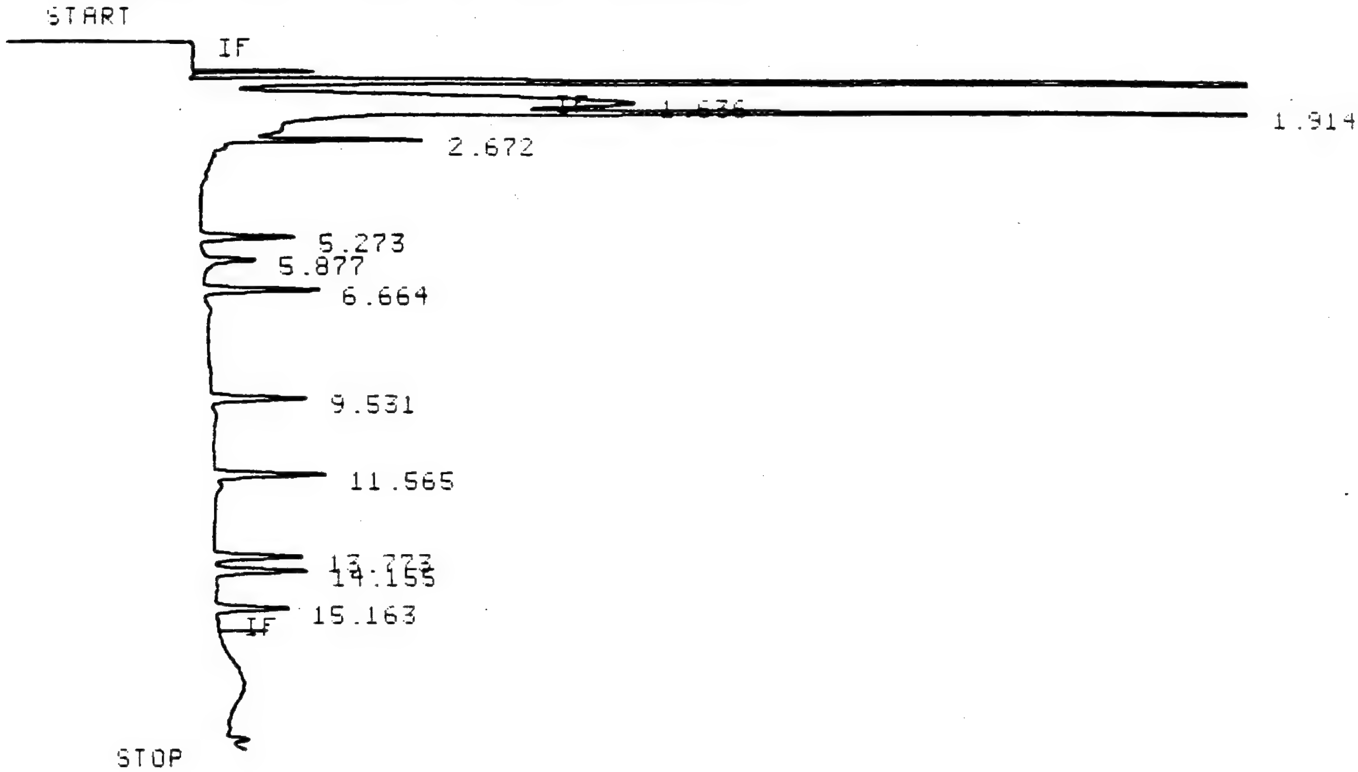
NO CALIB PEAKS FOUND
AREA%

RT	AREA	TYPE	WIDTH	AREA%
1.917	33610	PB	.076	82.53523
2.449	5834	BV	.367	14.32641
5.880	1278	PV	.148	3.13835

TOTAL AREA= 40722
MUL FACTOR=1.0000E+00

RUN # 144-002

* RUN # 145 MAY 14, 1991 09:57:21



RUN# 145 MAY 14, 1991 09:57:21

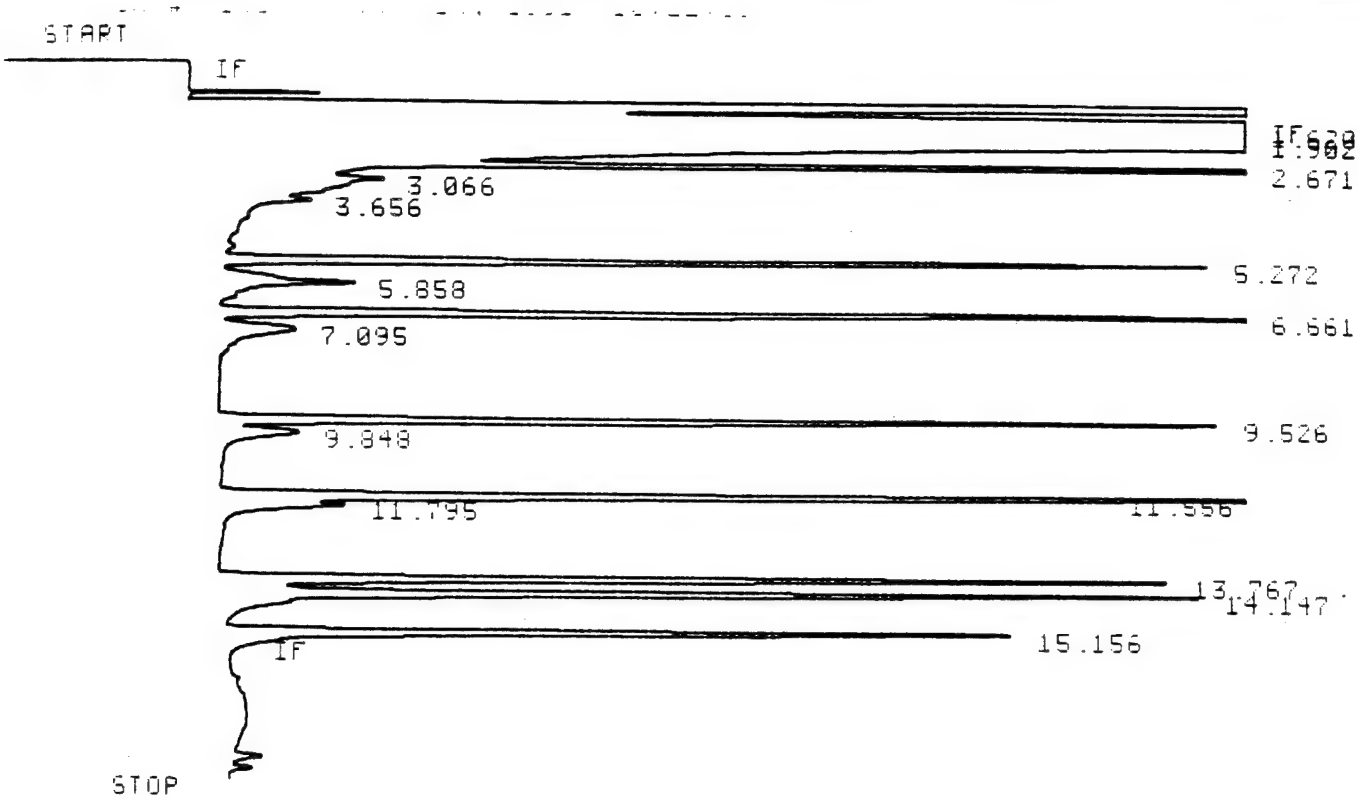
GULFPORT FIELD GULFPORT, MISSANG *Low Std*

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
1.636	BV	14640	.247		29.280	
1.914	VB	42811	.082		85.622	
2.672	VP	6154	.078	1	58.402	DCE
5.273	PV	5180	.128	2R	11.871	BENZENE
5.877	VB	3652	.159		7.304	
6.664	BP	6295	.127	3	69.806	TCE
9.531	PP	5227	.129	4	12.518	TOLUENE
11.565	VV	6755	.140	5	88.716	PCE
13.773	BP	5181	.137	6	20.467	E.BENZENE
14.155	PV	5387	.139	7	18.907	M-XYLENE
15.163	PV	4387	.138	8	12.145	O-XYLENE

TOTAL AREA= 105669
MUL FACTOR=1.0000E+00

RUN # 145-002



RUN# 146 MAY 14, 1991 10:22:59

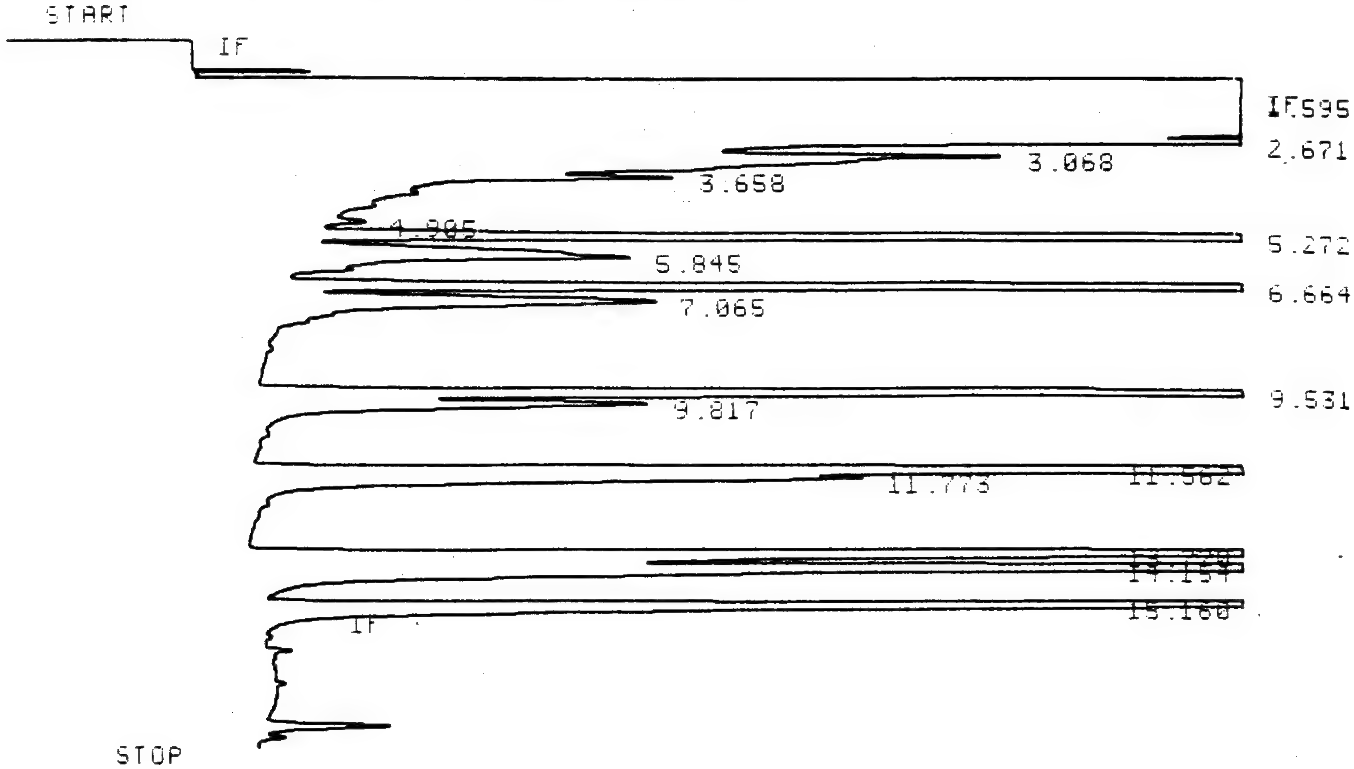
GULFPORT FIELD GULFPORT, MISSANG Medium Std

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
1.620	BV	111245	.252		222.490	
2.671	PB	64721	.078	1	462.505	DCE
3.066	BV	7027	.281		14.054	
3.656	VP	925	.065		1.850	
5.272	PP	52846	.125	2R	113.510	BENZENE
5.858	PV	13858	.243		27.716	
6.661	PV	67934	.126	3	574.885	TCE
7.095	VV	12200	.377		24.400	
9.526	PV	57115	.133	4	117.127	TOLUENE
9.848	VV	9862	.291		19.724	
11.556	PV	75438	.142	5	678.171	PCE
11.795	VV	11560	.216		23.120	
13.767	PV	57775	.141	6	109.116	E.BENZENE
14.147	VV	63524	.151	7	114.328	M-XYLENE
15.156	PB	46266	.140	8	96.580	O-XYLENE

TOTAL AREA= 652296
MUL FACTOR=1.0000E+00

RUN # 146-002



RUN# 147 MAY 14, 1991 10:48:26

GULFPORT FIELD GULFPORT, MISSANG High Std

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	PPB	NAME
2.671	PB	294361	.078	1	2057.827	DCE
3.068	BV	41550	.299		83.100	
3.658	VP	5842	.084		11.684	
4.905	PP	1900	.129		3.800	
5.272	PV	232638	.125	2R	498.497	BENZENE
5.845	VV	47787	.340		95.574	
6.664	PV	305395	.126	3	2530.072	TCE
7.065	VV	51342	.319		102.684	
9.531	PV	251536	.133	4	510.317	TOLUENE
9.817	VV	44263	.263		88.526	
11.562	BV	344796	.143	5	2999.216	PCE
11.773	VV	48783	.186		97.566	
13.770	PV	269922	.150	6	468.176	E.BENZENE
14.154	VB	289988	.159	7	486.524	M-XYLENE
15.160 I	BH	227615	.155	8	466.496	O-XYLENE

TOTAL AREA=2457718
MUL FACTOR=1.0000E+00

RUN # 147-002

WELCOME TO THE HP3396 CALIBRATION CURVE PLOTTING PROGRAM Rev. 8.01.00

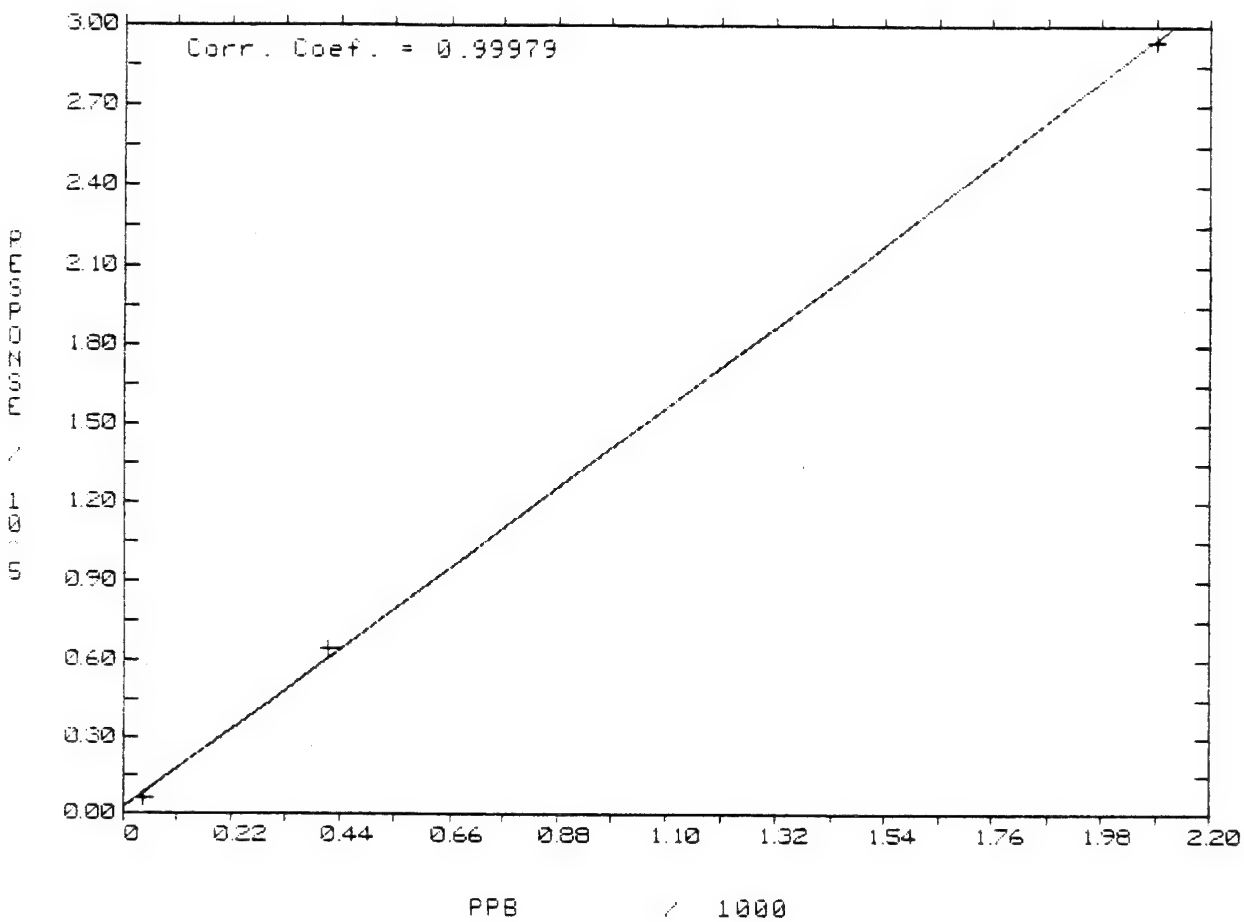
At any prompt: 'Q' [ENTER] Quits
'S' [ENTER] Starts Over

Load which method or calib. file [Current active*]:

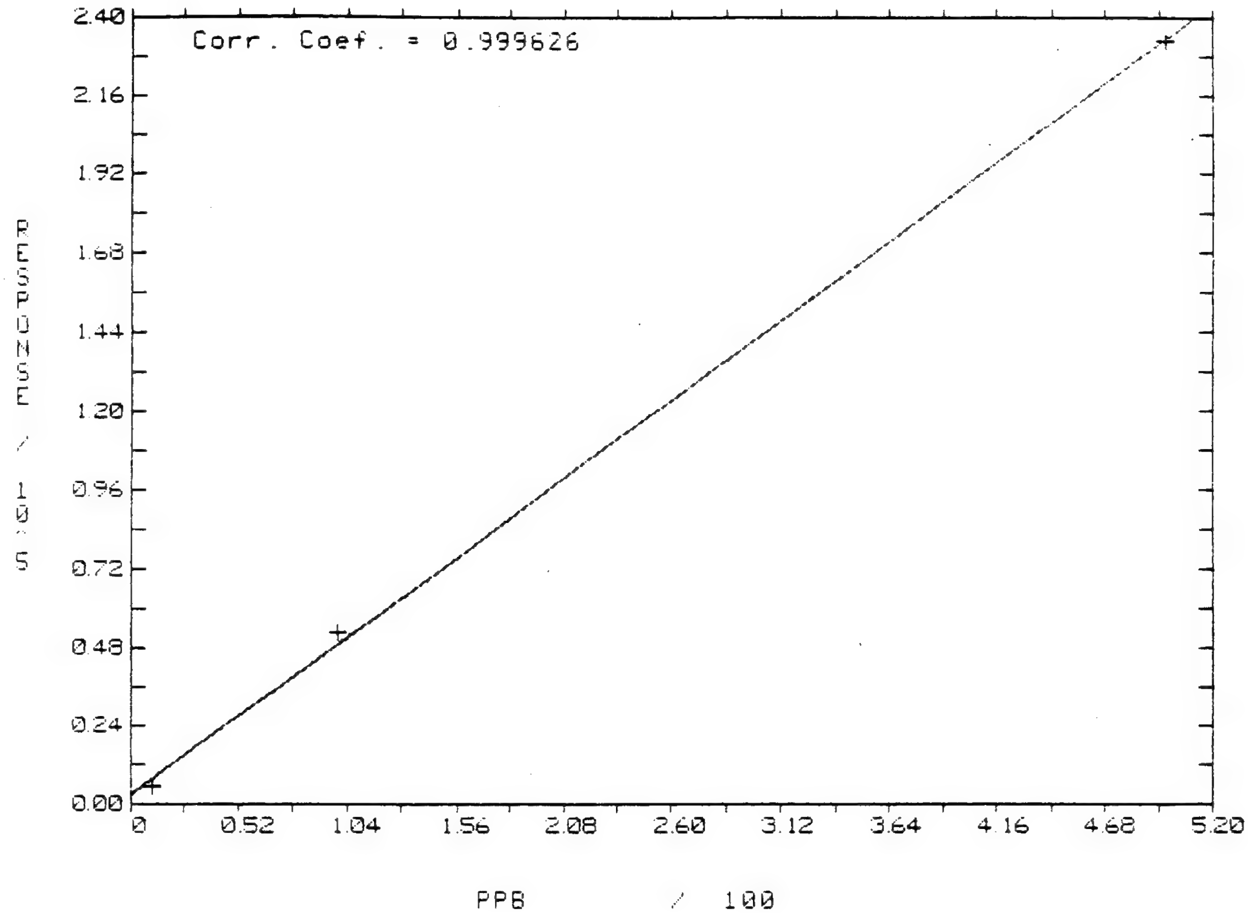
Plot the calibration curve for which CAL # [All*]:

ABSOLUTE Amount vs. Area for Cal # 1

PPB = -2.13E+01 +7.16E-03 (RESPONSE)

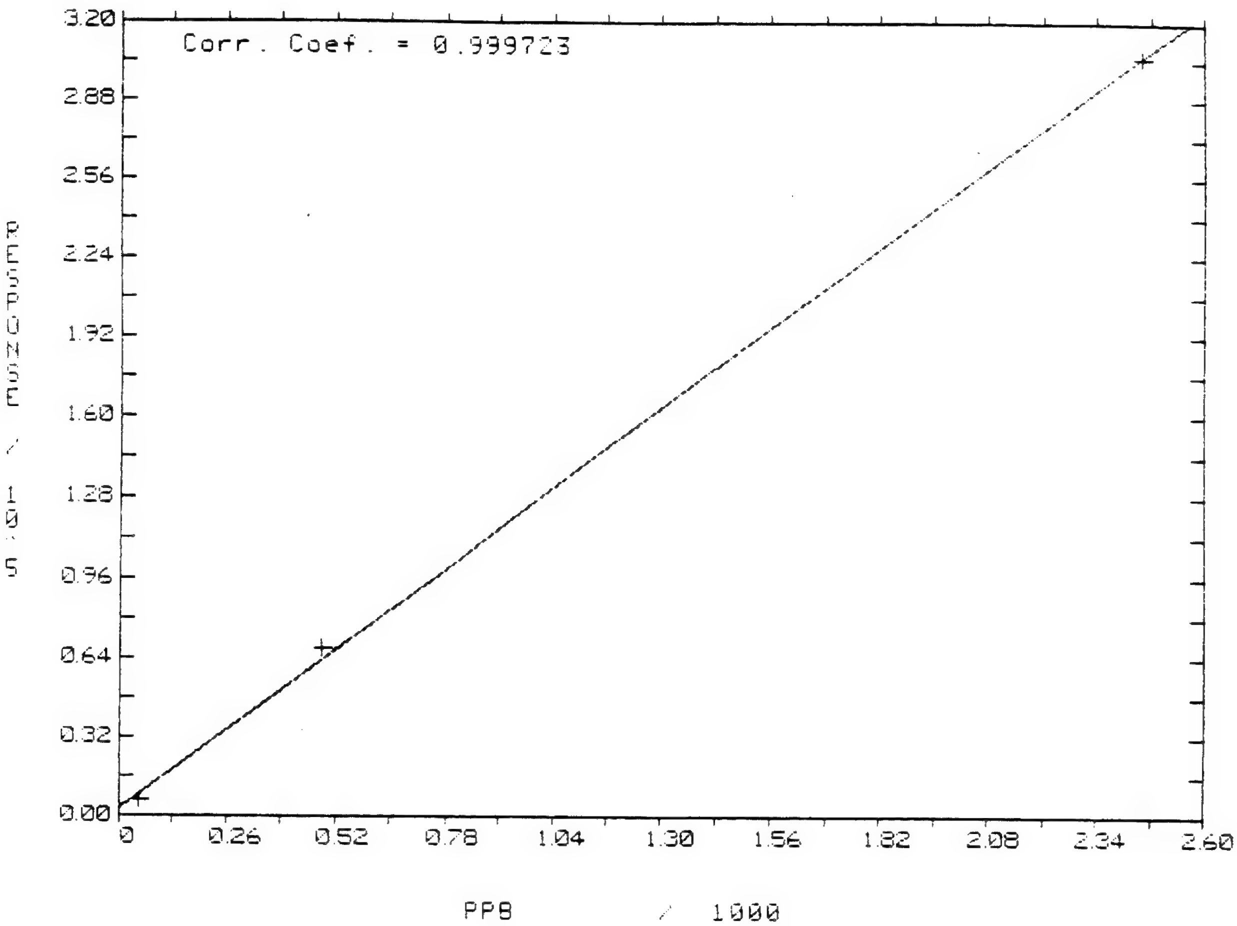


ABSOLUTE Amount vs. Area for Cal # 1
PPB = -7.19E+00 +2.16E-03 (RESPONSE)

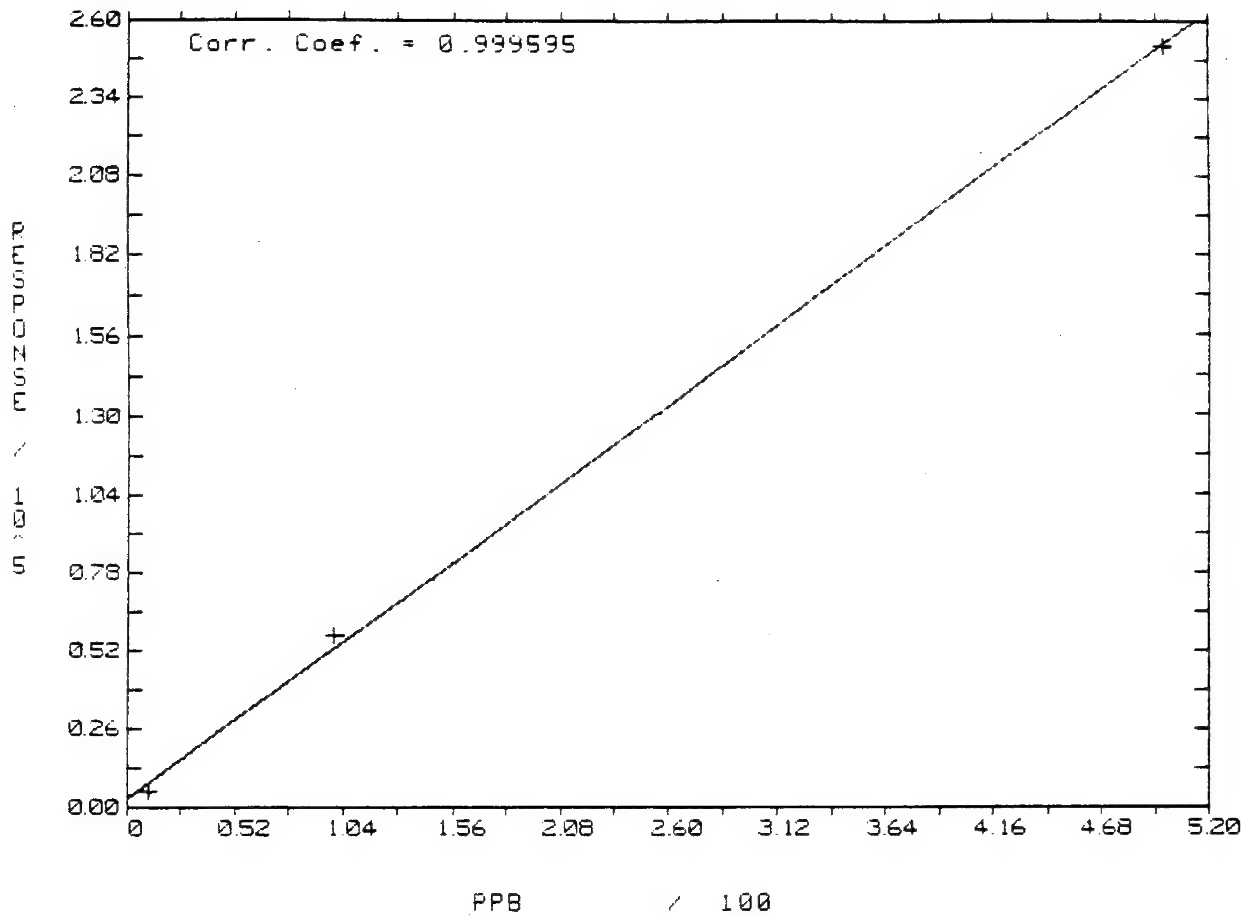


ABSOLUTE Amount vs. Area for Cal # 3

PPB = -2.75E+01 +8.09E-03 (RESPONSE)

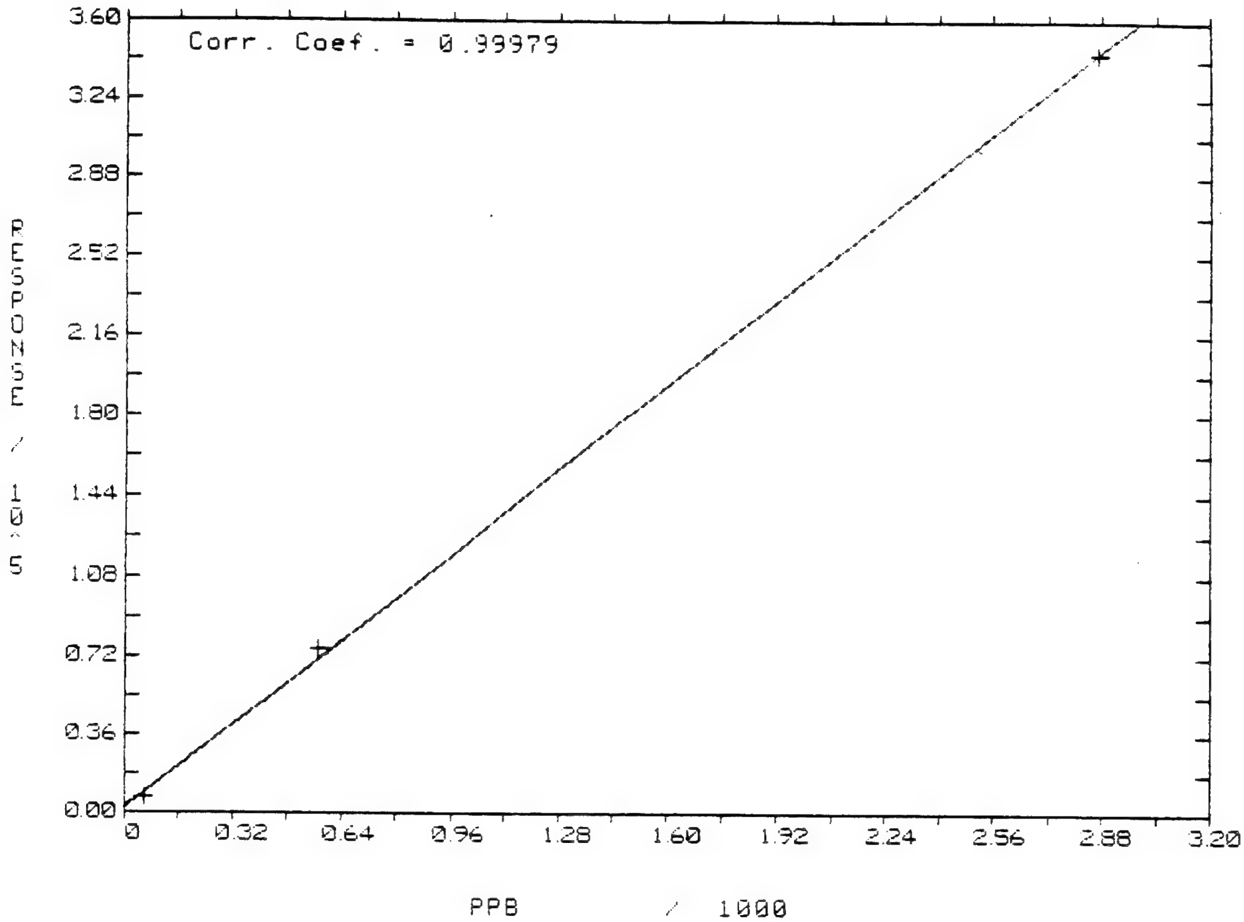


ABSOLUTE Amount vs. Area for Cal # 4
PPB = -6.70E+00 +2.00E-03 (RESPONSE)

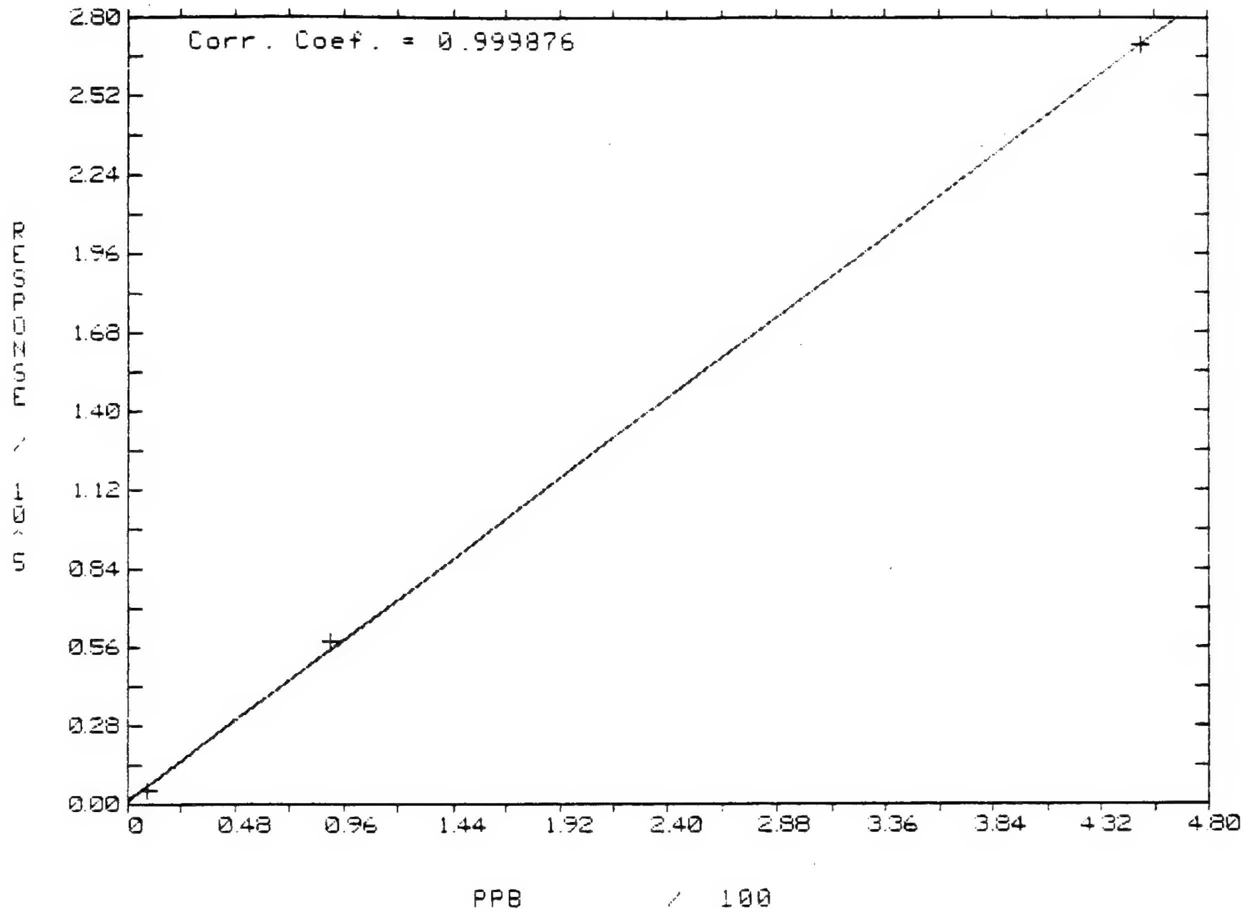


ABSOLUTE Amount vs. Area for Cal # 5

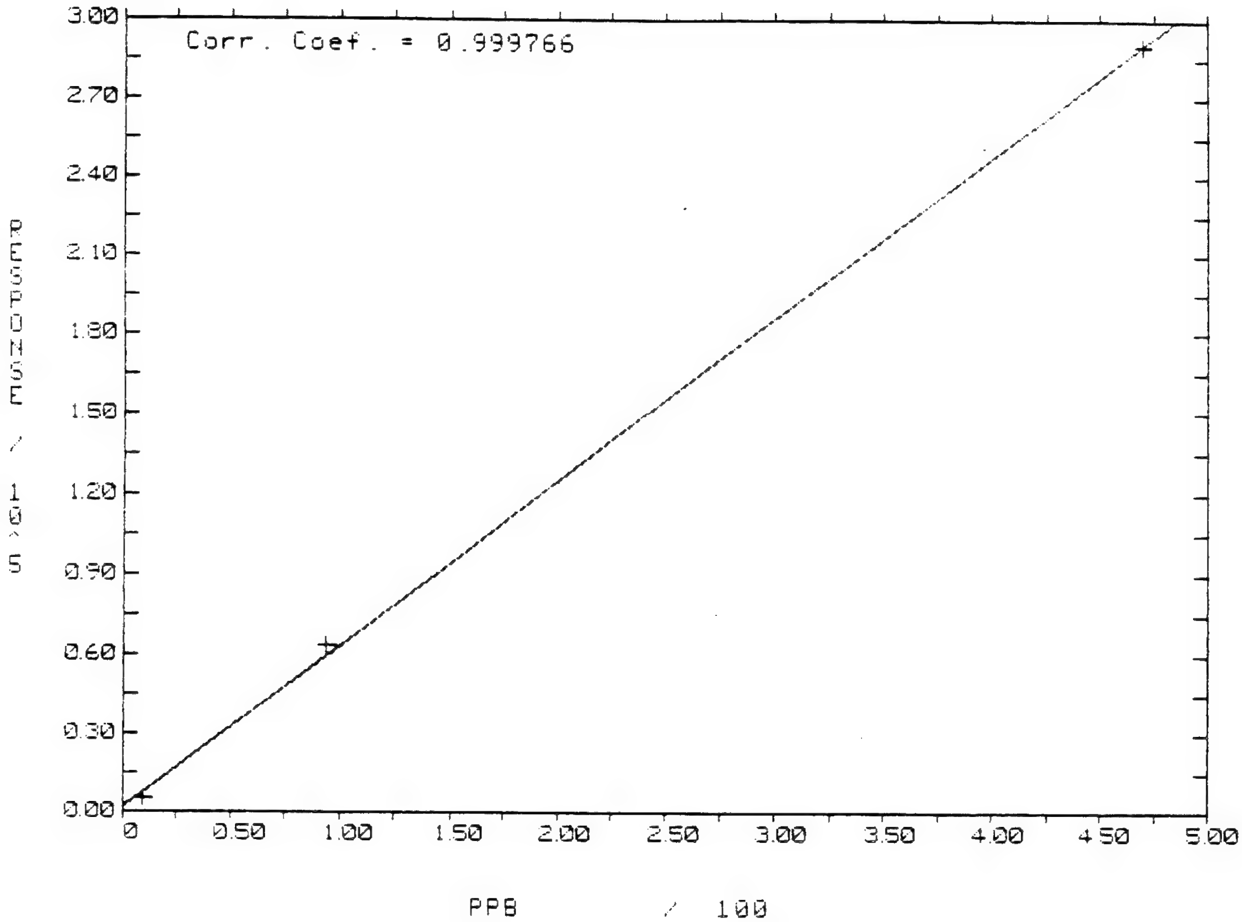
PPB = -2.53E+01 +8.38E-03 (RESPONSE)



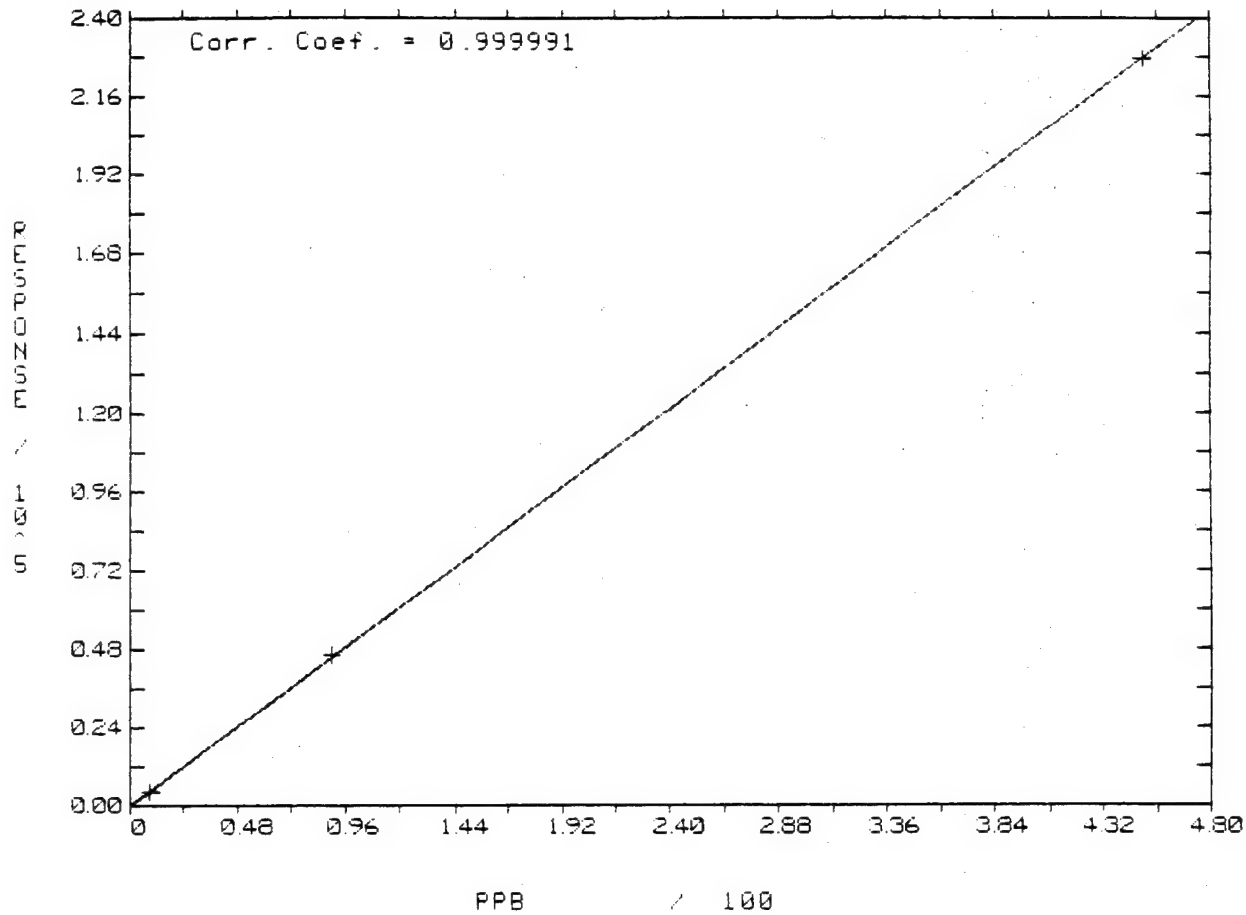
ABSOLUTE Amount vs. Area for Cal # 6
PPB = -2.83E+00 +1.67E-03 (RESPONSE)



ABSOLUTE Amount vs. Area for Cal # 7
PPB = -3.89E+00 +1.63E-05 (RESPONSE)



ABSOLUTE Amount vs. Area for Cal # 8
PPB = -5.11E-01 +1.98E-03 (RESPONSE)



Appendix B
CSL QUALITY CONTROL DATA
FOR THE DRILLING ACTIVITIES AT GULFPORT

CSL EVALUATUION SUMMARY
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT
GULFPORT, MISSISSIPPI

Parameter	Number of Samples	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE
DATE 05/05/91									
Total Samples	11								
Blanks	5	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	2								
Range, % RPD		0-67	0-62	0-75	0-66	0-86	0-78	0-82	0-89
Average, % RPD		33	31	38	33	43	39	41	45
Matrix Spikes	2								
Range, % Recovery		52-105	52-100	49-108	51-101	47-118	51-117	48-115	52-137
Average, % Recovery		79	76	78	75	87	84	82	95
DATE 05/09/91									
Total Samples	25								
Blanks	2	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	4								
Range, % RPD		0-15.18	0-11.32	0-15.68	0-10.23	0-18.39	0-22.22	0-23.83	0-21.99
Average, % RPD		4	3	4	3	4	5	6	5
Matrix Spikes	4								
Range, % Recovery		100-126	101-119	100-130	102-122	95-122	89-131	90-134	94-133
Average, % Recovery		115	112	116	113	114	113	115	117

CSL EVALUATUION SUMMARY
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT
GULFPORT, MISSISSIPPI

Parameter	Number of Samples	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE
DATE 05/10/91									
Total Samples	6								
Blanks	6	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	2								
Range, % RPD		0-31.62	0-26.77	0-32.53	0-30.89	0-37.82	0-33.90	0-36.92	0-64.00
Average, % RPD		16	13	16	15	18	17	18	32
Matrix Spikes	2								
Range, % Recovery		49-67	57-72	49-69	52-71	44-65	54-77	51-77	51-104
Average, % Recovery		58	64	59	62	55	66	64	78
DATE 05/14/91									
Total Samples	7								
Blanks	1	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	2								
Range, % RPD		0-20.20	0-17.51	0-22.26	0-19.64	0-25.89	0-24.08	0-33.17	0-20.75
Average, % RPD		10	9	11	9	13	12	16	10
Matrix Spikes	2								
Range, % Recovery		97-119	100-119	97-121	101-123	94-122	93-119	88-123	106-130
Average, % Recovery		108	110	109	112	108	106	106	118

CSL EVALUATUION SUMMARY
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT
GULFPORT, MISSISSIPPI

Parameter	Number of Samples	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE
DATE 05/15/91									
Total Samples	14								
Blanks	1	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	4								
Range, % RPD		0-2.23	0-2.02	0-19.17	0-40.34	0-4.71	0-2.76	0-2.58	0-4.38
Average, % RPD		1	1	5	10	1	1	1	1
Matrix Spikes	4								
Range, % Recovery		95-122	99-122	120-153	123-191	90-122	91-122	91-126	89-133
Average, % Recovery		109	111	130	146	107	106	108	111
DATE 05/16/91									
Total Samples	39								
Blanks	1	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	6								
Range, % RPD		0-3.61	0-2.58	0-3.98	0-5.41	0-7.56	0-9.09	0-11.94	0-13.53
Average, % RPD		1	1	1	2	3	2	4	3
Matrix Spikes	6								
Range, % Recovery		80-101	78-119	80-126	80-133	73-131	70-124	67-128	69-127
Average, % Recovery		90	94	99	103	100	95	94	97

QSL EVALUATUION SUMMARY
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT
GULFPORT, MISSISSIPPI

Parameter	Number of Samples	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE
DATE 05/21/91									
Total Samples	14								
Blanks	1	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	3								
Range, % RPD		0-2.65	0-1.87	0-3.97	0-1.27	0-2.05	0-1.16	0-7.91	0-1.08
Average, % RPD		1	1	1	1	1	1	1	1
Matrix Spikes	2								
Range, % Recovery		98-101	107-109	97-101	78-79	67-69	96-97	90-98	102-103
Average, % Recovery		99	108	99	78	68	96	94	102
DATE 05/22/91									
Total Samples	3								
Blanks	1	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Duplicates	2								
Range, % RPD		0-5.42	0-5.18	0-5.27	0-19.56	0-8.64	0-5.97	0-1.46	0-3.87
Average, % RPD		3	3	3	10	4	3	1	2
Matrix Spikes	2								
Range, % Recovery		73-77	95-100	121-127	144-175	79-86	72-77	72-73	84-88
Average, % Recovery		75	97	124	159	82	74	73	86

Appendix C
CSL DATA
FOR THE DRILLING ACTIVITIES AT GULFPORT

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
BK-B1-0	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
BK-B1-0 MS	5/09/91	420	100	488	102	548	80	85	85	959
BK-B1-0 MSD	5/09/91	489	112	571	113	659	100	108	106	948
BK-B1-2	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
BK-B1-4	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
BK-MW1-1	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9
S1-MW1-1	5/16/91	BMDL	495	BMDL	BMDL	BMDL	16	16	BMDL	619
S1-MW2-1	5/16/91	BMDL	BMDL	BMDL	2 *	BMDL	BMDL	BMDL	BMDL	24
S1-MW3-1	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9
S1-MW3-1 MS	5/15/91	504	120	587	123	686	107	115	117	950
S1-MW3-1 MSD	5/15/91	508	121	600	125	698	110	118	120	972
S1-PZ1-1	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9
S1-PZ2-1	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	8
S1-PZ3-1	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
BK-B1-0	
BK-B1-0 MS	
BK-B1-0 MSD	
BK-B1-2	
BK-B1-4	
BK-MW1-1	An unidentified peak appears but does not chromatograph with any of the standards.
S1-MW1-1	Several unidentified peaks also.
S1-MW2-1	An unidentified peak appears but does not chromatograph with any of the standards. Also a Toluene peak of 2 ppb.
S1-MW3-1	An unidentified peak appears but does not chromatograph with any of the standards.
S1-MW3-1 MS	
S1-MW3-1 MSD	
S1-PZ1-1	An unidentified peak appears but does not chromatograph with any of the standards.
S1-PZ2-1	An unidentified peak appears but does not chromatograph with any of the standards.
S1-PZ3-1	An unidentified peak appears but does not chromatograph with any of the standards.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S1-PZ3-1 MS	5/14/91	405	99	475	101	538	84	83	95	935
S1-PZ3-1 MSD	5/14/91	496	118	594	123	698	107	116	117	1203
S1-B1-0	5/09/91	BMDL	60	>83000	>12000	>39000	>17000	>31000	>7400	>301000
S1-B1-0 (Rerun)	5/10/91	BMDL	105	>18000	>3700	>13000	>6400	>13000	>3100	>150000
S1-B1-2	5/09/91	BMDL	581	>7800	1411	>6700	>5500	>12000	>3900	108000
S1-B1-4	5/09/91	BMDL	BMDL	>236000	>48000	>176000	>86000	>196000	>43000	>1400000
S1-B1-4 (Rerun)	5/10/91	BMDL	1820	>169000	>35000	>121000	>60000	>127000	>30000	>1400000
S1-B2-0	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	52
S1-B2-0 (Rerun)	5/10/91	BMDL	BMDL	2067	BMDL	BMDL	1166	1484	BMDL	6776
S1-B2-2	5/09/91	BMDL	BMDL	>19000	2997	>23000	>8600	>10000	>15000	>169000
S1-B2-4	5/09/91	BMDL	BMDL	664	1494	4233	3320	6806	6806	>68000
S1-B3-0	5/09/91	BMDL	BMDL	>119000	>8100	>41000	>79000	>34000	>161000	>1100000
S1-B3-0 (Rerun)	5/10/91	BMDL	BMDL	>32000	>4200	>360000	>20000	>59000	>16000	>730000
S1-B3-2	5/09/91	BMDL	BMDL	>117000	>9600	>45000	>44000	>19000	>55000	>451000
S1-B3-2 (Rerun)	5/10/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-B3-4	5/09/91	BMDL	BMDL	>1900	>5800	>119000	>7300	>18000	>31000	>71000

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S1–PZ3–1 MS	
S1–PZ3–1 MSD	
S1–B1–0	Very strong fuel odor. Several unidentified peaks also.
S1–B1–0 (Rerun)	
S1–B1–2	Very strong fuel odor. Several unidentified peaks also.
S1–B1–4	Very strong fuel odor. Several unidentified peaks also.
S1–B1–4 (Rerun)	
S1–B2–0	Very strong fuel odor. Several unidentified peaks also. Carryover from previous samples.
S1–B2–0 (Rerun)	
S1–B2–2	Very strong fuel odor. Several unidentified peaks also.
S1–B2–4	Very strong fuel odor. Several unidentified peaks also.
S1–B3–0	Very strong fuel odor. Several unidentified peaks also.
S1–B3–0 (Rerun)	
S1–B3–2	Very strong fuel odor. Several unidentified peaks also.
S1–B3–2 (Rerun)	Chromatograpy shows carryover from previous samples.
S1–B3–4	Very strong fuel odor. Several unidentified peaks also.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S1-SS1-0	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	427
S1-SS1-0 MS	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS1-0 MS	5/10/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS1-0 MS	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS1-0 MSD	5/09/91	350	82	403	81	462	68	71	68	683
S1-SS1-0 MSD	5/10/91	282	72	336	71	371	69	72	94	712
S1-SS1-0 MSD	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS1-0 MSD 2ND S	5/10/91	205	55	242	52	253	49	48	46	468
S1-SS1-0 (Rerun)	5/10/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	35
S1-SS1-0 (Rerun)	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS1-30	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	36
S1-SS2-0	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S1-SS2-30	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
S1-SS3-0	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	30
S1-SS3-30	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	25

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S1–SS1–0	
S1–SS1–0 MS	Only the MSD was runned.
S1–SS1–0 MS	MS does not chromatogram for this sample.
S1–SS1–0 MS	MS and MSD do not chromatogram for this sample.
S1–SS1–0 MSD	
S1–SS1–0 MSD	
S1–SS1–0 MSD	MS and MSD do not chromatogram for this sample.
S1–SS1–0 MSD 2ND SHOT	
S1–SS1–0 (Rerun)	Chromatograpy shows carryover from previous samples.
S1–SS1–0 (Rerun)	Rerun of sample.
S1–SS1–30	
S1–SS2–0	
S1–SS2–30	An unidentified peak appears but does not chromatograph with any of the standards.
S1–SS3–0	An unidentified peak appears but does not chromatograph with any of the standards.
S1–SS3–30	An unidentified peak appears but does not chromatograph with any of the standards.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S1-SW1	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	10
S1-SW1 DUP	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	8
S1-SW1 MS	5/09/91	528	118	635	122	698	118	126	120	1049
S1-SW1 MSD	5/09/91	483	112	579	115	703	107	112	112	950
S1-SW2	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	11
S1-SW3	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9
BK-B2-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	29
BK-B2-2	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	24
BK-B2-4	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	20
BK-MW2-1	5/21/91	BMDL	2 *	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
BK-MW2-1 DUP	5/21/91	BMDL	2 *	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
BK-MW2-1 MS	5/21/91	410	106	476	79	395	87	92	93	1103
BK-MW2-1 MSD	5/21/91	421	108	494	78	387	86	85	92	1110
S2-MW1-1	5/21/91	BMDL	10	356	493	BMDL	BMDL	BMDL	BMDL	536
S2-MW2-1	5/22/91	BMDL	167	540	349	BMDL	62	250	BMDL	1641

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S1–SW1	An unidentified peak appears but does not chromatograph with any of the standards.
S1–SW1 DUP	An unidentified peak appears but does not chromatograph with any of the standards.
S1–SW1 MS	
S1–SW1 MSD	
S1–SW2	An unidentified peak appears but does not chromatograph with any of the standards.
S1–SW3	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B2–0	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B2–2	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B2–4	An unidentified peak appears but does not chromatograph with any of the standards.
BK–MW2–1	An unidentified peak appears but does not chromatograph with any of the standards.
BK–MW2–1 DUP	An unidentified peak appears but does not chromatograph with any of the standards.
BK–MW2–1 MS	
BK–MW2–1 MSD	
S2–MW1–1	Several unidentified peaks also.
S2–MW2–1	Several unidentified peaks also.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S2-MW3-1	5/21/91	BMDL	236	1626	465	BMDL	25	6 *	BMDL	4066
S2-MW4-1	5/21/91	BMDL	114	883	285	BMDL	BMDL	3 *	BMDL	2916
S2-MW5-1	5/21/91	BMDL	25	764	227	BMDL	BMDL	3 *	BMDL	1774
S2-MW6-1	5/22/91	BMDL	BMDL	581	248	BMDL	BMDL	BMDL	BMDL	735
S2-MW6-1 DUP	5/22/91	BMDL	5 *	898	396	BMDL	BMDL	BMDL	BMDL	1076
S2-MW6-1 MS	5/22/91	322	99	591	174	454	69	68	79	1546
S2-MW6-1 MSD	5/22/91	305	94	623	143	495	65	69	76	1674
S2-PZ1-1	5/16/91	BMDL	BMDL	BMDL	84	17	BMDL	BMDL	BMDL	154
S2-PZ2-1	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	6
S2-PZ2-1 DUP	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	7
S2-PZ2-1 MS	5/16/91	489	115	593	129	569	109	114	111	1167
S2-PZ2-1 MSD	5/16/91	507	118	617	132	609	112	120	114	1214
S2-PZ3-1	5/16/91	4267	952	1586	396	76	11	14	BMDL	8573
S2-PZ4-1	5/16/91	730	142	591	20	205	245	273	8 *	2992
S2-PZ5-1	5/16/91	BMDL	60	827	341	1387	BMDL	20	19	6810

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S2–MW3–1	Several unidentified peaks also.
S2–MW4–1	Several unidentified peaks also.
S2–MW5–1	Several unidentified peaks also.
S2–MW6–1	Several unidentified peaks also.
S2–MW6–1 DUP	Several unidentified peaks also.
S2–MW6–1 MS	
S2–MW6–1 MSD	
S2–PZ1–1	
S2–PZ2–1	
S2–PZ2–1 DUP	
S2–PZ2–1 MS	
S2–PZ2–1 MSD	
S2–PZ3–1	
S2–PZ4–1	An O–Xylene peak of 8ppb.
S2–PZ5–1	

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S2-B10-0	5/16/91	BMDL	BMDL	BMDL	106	BMDL	BMDL	BMDL	BMDL	3401
S2-B10-0 (Rerun)	5/21/91	BMDL	BMDL	BMDL	21	BMDL	BMDL	BMDL	BMDL	55
S2-B10-2	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	2427
S2-B10-2 (Rerun)	5/21/91	BMDL	BMDL	BMDL	19	BMDL	BMDL	BMDL	BMDL	33
S2-B10-4	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	2516
S2-B10-4 (Rerun)	5/21/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	33
S2-B11-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	34
S2-B11-2	5/16/91	BMDL	BMDL	6 *	4 *	BMDL	BMDL	BMDL	BMDL	36
S2-B11-4	5/16/91	BMDL	69	477	1483	1991	34	9	25	10640
S2-B12-0	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	39
S2-B12-2	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	43
S2-B12-4	5/15/91	BMDL	BMDL	151	37	BMDL	BMDL	BMDL	BMDL	168
S2-B1-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	5 *	BMDL	84
S2-B1-0 MS	5/16/91	335	78	394	80	420	63	63	62	944
S2-B1-0 MSD	5/16/91	345	80	410	83	453	69	71	71	994
S2-B1-2	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9	43
S2-B1-4	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	12

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S2–B10–0	Sample is diluted. Several unidentified peaks.
S2–B10–0 (Rerun)	Several unidentified peaks also.
S2–B10–2	Sample is diluted. Several unidentified peaks.
S2–B10–2 (Rerun)	
S2–B10–4	Sample is diluted.
S2–B10–4 (Rerun)	
S2–B11–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B11–2	A TCE peak of 6ppb,Toluene peak of 4ppb. Several unidentified peaks also.
S2–B11–4	
S2–B12–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B12–2	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B12–4	Several unidentified peaks also.
S2–B1–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B1–0 MS	
S2–B1–0 MSD	
S2–B1–2	Several unidentified peaks also.
S2–B1–4	An unidentified peak appears but does not chromatograph with any of the standards.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S2-B2-0	5/16/91	BMDL	BMDL	2385	765	900	BMDL	BMDL	BMDL	4050
S2-B2-2	5/16/91	BMDL	BMDL	BMDL	BMDL	215	BMDL	BMDL	BMDL	1765
S2-B2-2 (Rerun)	5/21/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	129
S2-B2-4	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	1960
S2-B2-4 (Rerun)	5/21/91	BMDL	BMDL	37	71	BMDL	BMDL	3 *	BMDL	74
S2-B3-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	48
S2-B3-2	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	32
S2-B3-2 MSD(Rerun)	5/21/91	411	99	497	80	3845	87	89	93	1082
S2-B3-2 MS(Rerun)	5/21/91	171	46	206	247	1419	38	37	37	415
S2-B3-2 (Rerun)	5/21/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
S2-B3-4	5/16/91	BMDL	BMDL	1660	BMDL	BMDL	BMDL	BMDL	BMDL	>3300
S2-B3-4 (Rerun)	5/21/91	BMDL	4 *	72	1130	2543	8 *	8 *	9	1296
S2-B3-4 DUP	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	870
S2-B3-4 DUP(Rerun)	5/21/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	25
S2-B4-0	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	30
S2-B4-2	5/15/91	BMDL	152	731	1973	4300	65	20	48	>13000
S2-B4-4	5/15/91	BMDL	BMDL	160	35	BMDL	BMDL	BMDL	BMDL	231

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S2–B2–0	Sample is diluted.
S2–B2–2	Sample is diluted. Several unidentified peaks. A Toluene peak of 5ppb.
S2–B2–2 (Rerun)	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B2–4	Sample is diluted. Several unidentified peaks.
S2–B2–4 (Rerun)	Several unidentified peaks also.
S2–B3–0	
S2–B3–2	Sample is diluted.
S2–B3–2 MSD(Rerun)	
S2–B3–2 MS(Rerun)	
S2–B3–2 (Rerun)	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B3–4	Sample is diluted. Several unidentified peaks.
S2–B3–4 (Rerun)	Several unidentified peaks also.
S2–B3–4 DUP	Sample is diluted.
S2–B3–4 DUP(Rerun)	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B4–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B4–2	Several unidentified peaks also.
S2–B4–4	Several unidentified peaks also.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S2-B5-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	47
S2-B5-2	5/16/91	BMDL	>1000	>9100	>100000	>273000	>3100	>1300	>2800	>669000
S2-B5-2 DUP	5/16/91	BMDL	BMDL	>6100	>900	>2700	BMDL	308	BMDL	>8100
S2-B5-4	5/16/91	BMDL	332	>9100	>82000	>202000	>2500	>1400	>3400	>550000
S2-B6-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	24
S2-B6-2	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	26
S2-B6-4	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	27
S2-B7-0	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S2-B7-0 DUP	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	24
S2-B7-2	5/15/91	BMDL	BMDL	1169	237	BMDL	BMDL	BMDL	BMDL	976
S2-B7-2 DUP	5/15/91	BMDL	>2550	>16000	>42000	>71000	>1300	494	217	>265000
S2-B7-2 DUP(Rerun)	5/15/91	BMDL	>14000	>90000	>245000	>397000	>7300	>3200	>6000	>1500000
S2-B7-4	5/15/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S2-B7-4 MS	5/15/91	408	100	749	190	543	83	87	81	906
S2-B7-4 MSD	5/15/91	399	98	618	143	518	82	86	80	845
S2-B7-4 (Rerun)	5/15/91	BMDL	BMDL	626	102	130	BMDL	BMDL	12	450
S2-B8-0	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	27

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S2–B5–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B5–2	Sample is diluted.
S2–B5–2 DUP	Sample is diluted. Several unidentified peaks.
S2–B5–4	Sample is diluted. Several unidentified peaks.
S2–B6–0	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B6–2	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B6–4	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B7–0	There are no unidentified peaks.
S2–B7–0 DUP	An unidentified peak appears but does not chromatograph with any of the standards.
S2–B7–2	Several unidentified peaks also.
S2–B7–2 DUP	Several unidentified peaks also.
S2–B7–2 DUP(Rerun)	Several unidentified peaks also.
S2–B7–4	Chromatograpy shows carryover from previous samples.
S2–B7–4 MS	
S2–B7–4 MSD	
S2–B7–4 (Rerun)	Several unidentified peaks also.
S2–B8–0	An unidentified peak appears but does not chromatograph with any of the standards.

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S2-B8-2	5/16/91	BMDL	>2800	>15000	>51000	>83000	>1400	>380	>1000	>390000
S2-B9-0	5/16/91	BMDL	BMDL	>9500	>1300	>2200	BMDL	BMDL	BMDL	>10000
S2-B9-2	5/16/91	BMDL	>5300	>29000	>61000	>103000	>2700	>700	>1800	>504000
BK-B3-0	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	37
BK-B3-1	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	34
BK-B3-1 DUP	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	34
BK-B3-2	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	31
BK-B3-4	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	15
BK-B3-4 MS	5/05/91	217	52	240	51	271	46	45	47	401
BK-B3-4 MSD	5/05/91	437	99	529	101	676	105	108	123	1228
BK-MW3-1	5/16/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
BK-MW3-1 MS	5/16/91	368	85	450	96	550	80	85	82	892
BK-MW3-1 MSD	5/16/91	370	85	452	96	557	78	77	81	965
S3-SS1-0	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	50
S3-SS1-4	5/05/91	BMDL	>2000	>10000	>6900	>22000	>4800	>125000	>6000	>485000

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S2–B8–2	Sample is diluted. Fuel odor.
S2–B9–0	Sample is diluted. Fuel odor.
S2–B9–2	Sample is diluted. Fuel odor.
BK–B3–0	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B3–1	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B3–1 DUP	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B3–2	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B3–4	An unidentified peak appears but does not chromatograph with any of the standards.
BK–B3–4 MS	MS sample appears to be half of the MSD sample.
BK–B3–4 MSD	
BK–MW3–1	An unidentified peak appears but does not chromatograph with any of the standards. Also a Toluene peak of 5ppb.
BK–MW3–1 MS	
BK–MW3–1 MSD	
S3–SS1–0	An unidentified peak appears but does not chromatograph with any of the standards.
S3–SS1–4	Sample has a strong odor of fuels. used only 0.10g in 10 mL. Chromatogram has several unidentified peaks

CSL RESULTS
MISSISSIPPI AIR NATIONAL GUARD (MISS ANG)
GULFPORT FIELD
GULFPORT, MISSISSIPPI

SAMPLE	DATE	DCE	BENZENE	TCE	TOLUENE	PCE	ETHYL BENZENE	M-XYLENE	O-XYLENE	TOTAL AREA BENZENE EQ
MDL (ppb)	-	42	10	49	10	57	9	9	9	-
S3-SS2-0	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S3-SS2-4	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S3-SS3-0	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0
S3-SS3-4	5/05/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	27
S3-MW1-1	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	13
S3-MW1-1 (Rerun)	5/14/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	9
S3-PZ1-1	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	60
S3-PZ2-1	5/09/91	BMDL	656	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	3441
S3-PZ3-1	5/09/91	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	17

*Below the Method Detection Limit (MDL), Parts per Billion(ppb).

Total Area for Benzene Equivalent (BENZENE EQ).

MS - Matrix Spike, MSD - Matrix Spike Duplicate, DUP - Duplicate

SAMPLE	COMMENTS
S3-SS2-0	
S3-SS2-4	
S3-SS3-0	
S3-SS3-4	An unidentified peak appears but does not chromatograph with any of the standards.
S3-MW1-1	An unidentified peak appears but does not chromatograph with any of the standards.
S3-MW1-1 (Rerun)	
S3-PZ1-1	Several standard peaks are below the method detection limit(BMDL). There are several unidentified peaks present also.
S3-PZ2-1	Several standard peaks are below the method detection limit(BMDL). There are several unidentified peaks present also.
S3-PZ3-1	An unidentified peak appears but does not chromatograph with any of the standards.

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Appendix E
Data Review and Validation
Technical Memorandum

MEMORANDUM

CH2M HILL

TO: Bob Goodson

FROM: Ann Castleberry
Ann West/WDC

DATE: November 1, 1991

SUBJECT: Data Review and Validation for Gulfport Field Training Site Mississippi ANG

PROJECT: MGM27963.A0.RP

1. INTRODUCTION

Soil and water samples were collected as part of the Gulfport Field Training Site, Mississippi Air National Guard Site Investigation (SI). The purpose of this memorandum is to summarize the criteria used and the results of the review and validation process. The data results are discussed in the main body of the SI report and are not included in this memorandum. Data validation is the technical review of a data package using criteria established in the Data Quality Objectives of the Quality Assurance Project Plan.

All the samples were submitted to, and analyzed by, the CH2M HILL laboratory located in Montgomery, Alabama.

2. DATA PACKAGE DELIVERABLES

When samples were submitted to the laboratory, they were assigned 8-digit unique numerical sample identifiers. The first 5 digits of the laboratory sample number identify the sample batch, and the last 3 numbers indicate each unique field sample. Attachment 1 is a summary of all the field samples submitted to the laboratories, and the corresponding laboratory numerical sample identifier and the requested analytical parameters.

As indicated in Attachment 1, samples were submitted for HAZWRAP Level C QC. Level C data package deliverables were provided for the other analytical methods, and they are summarized in Table 1.

Table 1
Level C Data Package Deliverables

ORGANICS--GC/MS

Form	Purpose
I	Sample results
II	Surrogate spike results
III	Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike results
IV	Method blank data
V	GC/MS tuning data
VI	Initial calibration data
VII	Continuing calibration data
VIII	Internal standard area data

METALS

I	Sample results
II	Initial and continuing calibration data
III	Method blank results
IV	ICP interference check sample results
V	Spike recovery data
VI	Duplicate sample results
VII	Laboratory control sample results
VII	Standard addition results
X	Holding times

3. LEVEL C REVIEW AND VALIDATION CRITERIA

Samples that were analyzed using Contract Laboratory Program (CLP) methods were reviewed and validated by the project chemists using the guidance in HWP-65/R1. When non-CLP methods were used, the data were reviewed and validated in the same manner using laboratory-specific acceptance criteria.

ORGANIC ANALYSES

Organic data were generated using CLP methods and were reviewed and validated using the guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses," 1988 revision. This guidance document lists criteria for evaluating the data package form by form. The raw experimental data were summarized and presented on the appropriate form because no raw data were included in the data package.

Form I, Data Results

This form presents the sample results and the information necessary for calculating holding times, and is also reviewed for completeness. Holding time is defined as the time, in days, from sample collection to sample extraction/analysis. It is important to note that the holding time for extraction often is different for water and soil samples for the same analytical method. Holding times are summarized in Table 2. For volatile organic compound (VOC) analysis, both a preserved and unpreserved sample were submitted to the lab. Unless otherwise specifically noted on the data summary form, the preserved sample was analyzed.

Form II, Surrogate Recovery

This form summarizes the surrogate spike recovery information. Surrogate spike recoveries are used to demonstrate laboratory performance and to evaluate matrix interference. Surrogate compounds are the structural homologs of target list compounds (TCL), often TCL compounds with deuterium substituted for hydrogen, and are therefore expected to behave in a manner similar to TCL compounds during analysis. Spike recoveries may also used to estimate accuracy, which is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Surrogate spike recovery limits are defined either in the CLP statement of work (SOW) or by laboratory-specific control charts.

Table 2
Holding Times

Analysis	Matrix	Holding time (days) Extraction	Analysis
VOC	water	-	14 days*
	soil	-	14 days
SVOC	water	7 days	40 days
	soil	14 days	40 days
Metals	water	-	180 days
	soil	-	180 days
Mercury	water	-	28 days
	soil	-	28 days

Abbreviations: VOC--volatile organic compounds
SVOC--semivolatile organic compounds

Note: *--both a preserved and unpreserved sample were collected. The unpreserved sample must be analyzed within 7 days, while the preserved one must be analyzed within 14 days. The lab typically analyzed the preserved sample.

Form III, Matrix Spike/Matrix Spike Duplicate Results

This form presents the recoveries of the MS/MSD compounds. Matrix spike compounds are found on the method TCL. The field sample is split and two portions are spiked with known quantities of TCL compounds in order to ascertain the effect of the specific sample matrix on the recovery of target analytes. MS/MSD recoveries also may be used to estimate precision, which is a measure of the agreement or repeatability of a set of replicate results obtained from duplicate analyses made under the same conditions. Matrix spike recovery limits are defined either in the CLP SOW or by the laboratory-specific control charts.

Form IV, Method Blank Summary

The method blank summary sheets correlate method blanks to specific samples. Method blanks are American Society for Testing and Metals (ASTM) Type II water that is treated as a sample in the laboratory; in other words, it undergoes the same analytical process as the corresponding samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was analyzed for every 10 samples, or one per batch, whichever is more frequent. An analyte detected in both a sample and the corresponding method blank is said to result from laboratory contamination if the level in the sample was less than 10 times the concentration in the method blank (10 times for common laboratory contaminants).

Form V, GC/MS Tuning and Mass Calibration

This form presents the tuning and mass calibration information for each GC/MS instrument used to produce data for the sample delivery group. The CLP SOW establishes tuning and performance criteria in order to ensure mass resolution, identification, and to some degree sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances. Bromofluorobenzene (BFB) is used for volatile analyses, and Decafluorotriphenylphosphine (DFTPP) is used for semivolatile analyses. Gas chromatographs are calibrated and not tuned, so there is no tuning or mass calibration information for GC analyses.

Form VI, Initial and Continuing Calibration

This form is used to report compound recoveries from calibration solutions. Initial calibration data are used to demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period. Continuing calibration checks document that the instrument continues to produce acceptable data. Calibration spike recovery limits are defined either in the CLP SOW or the specific analytical method.

Form VIII, Internal Standards

This form presents the internal standards peak area information. Internal standard compounds are used to ensure that instrument sensitivity and response are stable during each analytical sequence. Acceptance criteria are defined either in the CLP SOW or the specific analytical method.

INORGANIC ANALYSES

All the inorganic data were generated using CLP methods and were reviewed and validated using the guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," 1988 revision. This guidance document lists criteria for evaluating the data package form by form. The raw experimental data were summarized and presented on the appropriate form since no raw data were included in the data package.

Form I, Sample Results

The form is similar to the organic form in that it summarizes the sample results; however, a separate form (Form X) is used to calculate sample holding time.

Form II, Initial and Continuing Calibration Verification

This form is similar to the organic form in that it summarizes the calibration results and is used to evaluate initial and continuing calibration. Form IIB is used to demonstrate that the laboratory was capable of analyzing below the Contract Required Detection Limit (CRDL) at the time of analysis. The laboratory analyzes a standard solution that is twice the instrument detection limit (IDL) to verify the linearity of the instrument at low detection limits.

Form III, Blanks

This form is used to report analyte concentrations detected in the initial calibration blank (ICB), continuing calibration blanks (CCB), and the preparation blanks (PB). As mentioned in the organics section, method blanks are used to monitor the presence and magnitude of contamination introduced during the analytical process.

Form IV, ICP Interference Check Sample (ICS)

This form is used to report ICS results for each ICP instrument used. The ICS sample is a mixture of analytes that have a potential for interference and is performed to verify the laboratory's interelement and background correction factors.

Form VA, Pre-digestion Spike Recovery

This form is used to report results for the pre-digestion spike recovery. This spike recovery measurement is analogous to the MS/MSD in that it provides a measure of the effects of the specific sample matrix on the sample results. Additionally it provides a measure of the efficiency of the digestion process. If the pre-digestion spike recovery does not fall within the 75 to 125 percent recovery window, then a post-digestion spike is added and the sample reanalyzed.

Form VB, Post-Digestion Spike Recovery

This form is used to report post-digestion spike results when they are necessary. The acceptance limits for post-digestion spike recoveries are also 75 to 125 percent. If both the pre- and post-digestion spike reveries are outside these acceptance limits, then this is considered positive evidence of matrix interference and the data are flagged appropriately.

Form VI, Duplicates

This form is used to report duplicate laboratory results rather than field duplicate sample results. Duplicate laboratory samples differ from MS/MSD samples in that the duplicate sample is not spiked; therefore, precision must be estimated using native rather than spiked results. For this reason, laboratory duplicates were performed only on field samples and not field QC samples.

Form VII, Laboratory Control Sample (LCS) Results

This form is used to report the recovery results for the standard LCS. The LCS analysis is designed to monitor the efficiency of the digestion process. Analyte recoveries must fall with 90 to 110 percent; if not, the data are flagged.

Form VIII, Standard Addition Results

This form is used to report the results of samples analyzed using the method of standard addition and is used only for Graphite Furnace Atomic Absorption analyses. Duplicate injections and furnace post-digestion spike recoveries are used to establish the precision and accuracy of the individual analytical determinations. Samples must be analyzed using the method of standard addition if the analyte concentration is greater than five times the CRDL. The CLP SOW requires that the results agree within ± 20 percent relative standard difference or else the data is qualified.

Form IX, ICP Serial Dilution Results

ICP serially diluted samples are used to monitor whether significant physical or chemical interferences exist as a result of sample matrix effects. The sample is diluted and the results compared (diluted versus undiluted) for agreement for any analyte whose concentration is 50 times greater than the IDL.

Form X, Holding Times

This form is used to report holding times for mercury and cyanide analyses. Sample results that are not analyzed within the holding time are flagged to indicate a low bias.

QUALIFYING FLAGS

Samples that did not meet the acceptance limit criteria were qualified with a flag, single letter abbreviations that indicate a problem with the data. Although the flags originate in the data validation section, they are included in the data summary tables (in the main body of the text) so that data will not be used indiscriminately. Flags used in this text include:

- **U** Undetected. Analyte was analyzed for but not detected above the method detection limit.

B The analyte was detected in both the field sample and the corresponding method blank.

J Estimated. The analyte was present, but the reported value may not be accurate or precise.

M Duplicate sample precision was greater than 20% relative percent difference.

It is important to note that the data summary form, Form I, may also have flags on them and the usage is the same as above with two major additions. For organic results, data that are above the method detection limit but below the CRDL are flagged with a J. For inorganic results, if the analyte was detected above the instrument detection limit, but below the CRDL, then the result is flagged with a B.

4. RESULTS AND CONCLUSIONS

The data were reviewed and validated as indicated in the preceding sections. As each data package was reviewed, a worksheet was completed for each analysis. A blank worksheet is shown in Figure 1. These worksheets were developed to act as a check-list for the data reviewer and are included in Attachment 2 to this appendix. Any non-conformances with the data package were noted on the worksheet and then appropriate flags were assigned to the data.

Acetone and methylene chloride are used as extraction solvents; hence, they are common laboratory contaminants. When detected in a sample, the concentration reported is the actual concentration in the sample; blank subtraction (concentration in the corresponding method blank minus the concentration in the sample) was not used. Therefore all the acetone and methylene chloride detected in these specific samples can be attributed to laboratory contamination.

The data are acceptable as is and can be used in the decision-making process without further qualification.

DATA VALIDATION

CASE: __________ SITE: __________________ ANALYSIS: __________

LAB NOTES: ____

____

____

HOLDING TIMES: ____

NUMBER OF SAMPLES: Soil ____________ Water ______________

CALIBRATION
Initial: ____

____

Continuing: ____

____

COEFFICIENT: ____

BLANKS
Method: ____

Field: ____

FIELD DUPLICATES: ____

SURROGATES: ____

MS/MSD: ____

INTERNAL STANDARDS: ______________ TUNING: _________________

OTHER: ____

____

SUMMARY: ____

____

____

____

____

Attachment 1

DATA INVENTORY TABLE

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTED TO LAB
3	3HA-1S-4	05/01/91	C	SOIL	18463-001	X	X	X				05/02/91
3	3HA-2S-4	05/01/91	C	SOIL	18463-002	X	X	X				05/02/91
3	3HA-3S-4	05/01/91	C	SOIL	18463-003	X	X	X				05/02/91
QC	ER5-1	05/01/91	C	WATER	18463-004	X	X	X				05/02/91
QC	TRIP BLANK	05/01/91	C	WATER	18463-005	X						05/02/91
BKGD	3BK-1S-1	05/02/91	C	SOIL	18470-001	X	X	X				05/03/91
BKGD	3BK-1S-1D	05/02/91	C	SOIL	18470-002	X	X	X				05/03/91
QC	TRIP BLANK	05/02/91	C	SOIL	18470-003	X						05/03/91
QC	FB5-3A	05/03/91	C	SOIL	18483-001	X	X	X				05/04/91
QC	ER5-2	05/02/91	C	SOIL	18483-002	X	X	X				05/04/91
QC	FB5-3B	05/03/91	C	SOIL	18483-003	X	X	X				05/04/91
QC	TRIP BLANK	05/03/91	C	SOIL	18483-004	X						05/04/91
1	1SD-2S-0	05/07/91	C	SOIL	18505-001	X	X	X				05/08/91
1	1SD-2S-30	05/07/91	C	SOIL	18505-002	X	X	X				05/08/91
1	1SD-3S-0	05/07/91	C	SOIL	18505-003	X	X	X				05/08/91
1	1SD-3S-30	05/07/91	C	SOIL	18505-004	X	X	X				05/08/91
1	1SB-1S-2	05/07/91	C	SOIL	18505-005	X	X	X				05/08/91
1	1SB-2S-0	05/07/91	C	SOIL	18505-006	X	X	X				05/08/91
1	1SB-2S-0DUP	05/07/91	C	SOIL	18505-007	X	X	X				05/08/91
1	1SB-3S-4	05/07/91	C	SOIL	18505-008	X	X	X				05/08/91
QC	TRIP BLANK	05/07/91	C	WATER	18505-009	X						05/08/91
1	1SW-2W	05/07/91	C	WATER	18505-010	X	X	X				05/08/91
1	1SW-2WDUP	05/07/91	C	WATER	18505-011	X	X	X				05/08/91
1	1SW-3W	05/07/91	C	WATER	18505-012	X	X	X				05/08/91
QC	ER5-8	05/07/91	C	WATER	18505-013	X	X	X				05/08/91
QC	TRIP BLANK	05/07/91	C	WATER	18505-014	X						05/08/91
BKGD	1BK-1S-0	05/08/91	C	SOIL	18521-001	X	X	X				05/09/91
QC	EB5-8A	05/08/91	C	WATER	18521-002	X	X	X				05/09/91
QC	EB5-8B	05/08/91	C	WATER	18521-003	X	X	X				05/09/91
QC	TRAVEL BLANK	05/08/91	C	WATER	18521-004	X						05/09/91
QC	FB5-9	05/09/91	C	WATER	18531-001	X	X	X				05/10/91
QC	TRAVEL BLANK	05/09/91	C	WATER	18531-002	X						05/10/91

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTED TO LAB
3	3MW-1W-1	05/10/91	C	WATER	18539-001	X	X	X	X			05/11/91
3	3MW-1W-1DUP	05/10/91	C	WATER	18539-002	X	X	X	X			05/11/91
QC	ER5-10A	05/10/91	C	WATER	18539-003	X	X	X				05/11/91
QC	ER5-10B	05/10/91	C	WATER	18539-004	X	X	X				05/11/91
BKGD	3BK-1W-1	05/10/91	C	WATER	18539-005	X	X	X	X			05/11/91
QC	TRAVEL BLANK	05/10/91	C	WATER	18539-006	X						05/11/91
2	2SB-7S-2	05/14/91	C	SOIL	18551-001	X	X	X				05/15/91
2	2SB-7S-2DUP	05/14/91	C	SOIL	18551-002	X	X	X				05/15/91
QC	ER5-14	05/14/91	C	WATER	18551-003	X	X	X				05/15/91
QC	TRIP BLANK	05/14/91	C	WATER	18551-004	X						05/15/91
1	1MW-3W-1	05/14/91	C	WATER	18551-005	X	X	X	X			05/15/91
BKGD	1BK-1W-1	05/14/91	C	WATER	18551-006	X	X	X	X			05/15/91
1	1MW-1W-1	05/15/91	C	WATER	18560-001	X	X	X	X			05/16/91
2	2SB-10S-2	05/15/91	C	SOIL	18560-002	X	X	X				05/16/91
2	2SB-11S-4	05/15/91	C	SOIL	18560-003	X	X	X				05/16/91
2	2SB-12S-2	05/15/91	C	SOIL	18560-004	X	X	X				05/16/91
2	2SB-4S-2	05/15/91	C	SOIL	18560-005	X	X	X				05/16/91
2	2SB-5S-4	05/15/91	C	SOIL	18560-006	X	X	X				05/16/91
2	2SB-1S-2	05/15/91	C	SOIL	18560-007	X	X	X				05/16/91
2	2SB-2S-4	05/15/91	C	SOIL	18560-008	X	X	X				05/16/91
QC	ER5-15	05/15/91	C	WATER	18560-009	X	X	X				05/16/91
QC	TRAVEL BLANK-S	05/15/91	C	WATER	18560-010	X						05/16/91
QC	TRAVEL BLANK-W	05/15/91	C	WATER	18560-011	X						05/16/91
2	2SB-3S-4	05/15/91	C	SOIL	18560-012	X	X	X				05/16/91
2	2SB-3S-4DUP	05/15/91	C	SOIL	18560-013	X	X	X				05/16/91
2	2SB-6S-2	05/15/91	C	SOIL	18560-014	X	X	X				05/16/91
1	1MW-2W-1	05/16/91	C	WATER	18572-001	X	X	X	X			05/17/91
QC	ER5-16	05/16/91	C	WATER	18572-002	X	X	X				05/17/91
QC	TRAVEL BLANK	05/16/91	C	WATER	18572-003	X						05/17/91
BKGD	2BK-1S-4	05/16/91	C	SOIL	18572-004	X	X	X				05/17/91
2	2SB-8S-2	05/16/91	C	SOIL	18572-005	X	X	X				05/17/91
2	2SB-9S-2	05/16/91	C	SOIL	18572-006	X	X	X				05/17/91

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTE TO LAB
QC	FB5-17A	05/17/91	C	WATER	18582-001	X	X	X				05/18/91
QC	FB5-17B	05/17/91	C	WATER	18582-002	X	X	X				05/18/91
QC	TRAVEL BLANK	05/17/91	C	WATER	18582-003	X						05/18/91
BKGD	2BK-1W-1	05/20/91	C	WATER	18589-001	X	X			X	X	05/21/91
2	2MW-5W-1	05/20/91	C	WATER	18589-002	X	X			X	X	05/21/91
QC	ER5-20	05/20/91	C	WATER	18589-003	X	X			X	X	05/21/91
QC	FB5-20A	05/20/91	C	WATER	18589-004	X	X			X	X	05/21/91
QC	FB5-20B	05/20/91	C	WATER	18589-005	X	X			X	X	05/21/91
QC	TRAVEL BLANK	05/20/91	C	WATER	18589-006	X						05/21/91
2	2MW-4W-1	05/21/91	C	WATER	18598-001	X	X			X	X	05/22/91
2	2MW-3W-1	05/21/91	C	WATER	18598-002	X	X			X	X	05/22/91
2	2MW-1W-1	05/21/91	C	WATER	18598-003	X	X			X	X	05/22/91
QC	ER5-21	05/21/91	C	WATER	18598-004	X	X			X	X	05/22/91
QC	TRAVEL BLANK	05/21/91	C	WATER	18598-005	X				X		05/22/91
2	2MW-6W-1	05/22/91	C	WATER	18605-001	X	X	X		X		05/23/91
2	2MW-6W-1DUP	05/22/91	C	WATER	18605-002	X	X	X		X		05/23/91
2	2MW-2W-1	05/22/91	C	WATER	18605-003	X	X	X		X		05/23/91
QC	ER5-22	05/22/91	C	WATER	18605-004	X	X	X		X		05/23/91
QC	TRAVEL BLANK	05/22/91	C	WATER	18605-005	X						05/23/91
2	2MW-1	6/17/91	C	WATER	18771-001	X	X			X	X	6/18/91
2	2MW-2	6/17/91	C	WATER	18771-002	X	X			X	X	6/18/91
QC	FB6-17	6/17/91	C	WATER	18771-003	X	X	X		X		6/18/91
QC	ER6-17	6/17/91	C	WATER	18771-004	X	X	X		X		6/18/91
QC	Trip Blank	6/17/91	C	WATER	18771-005	X				X		6/18/91
2	2MW-3W-2	6/18/91	C	WATER	18785-001	X	X			X	X	6/19/91
2	2MW-4W-2	6/18/91	C	WATER	18785-002	X	X			X	X	6/19/91
2	2MW-5W-2	6/18/91	C	WATER	18785-003	X	X			X	X	6/19/91
2	2MW-6W-2	6/18/91	C	WATER	18785-004	X	X			X	X	6/19/91
QC	ERB6-18	6/18/91	C	WATER	18785-005	X	X	X		X		6/19/91
2	2BK-1W-2	6/18/91	C	WATER	18785-006	X	X			X		6/19/91
2	2BK-1W-2	6/18/91	C	WATER	18785-007	X	X			X		6/19/91
QC	Trip Blank	6/18/91	C	WATER	18785-008	X				X		6/19/91

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTED TO LAB
1	1MW-1W-2	6/19/91	C	WATER	18794-001	X	X	X	X			6/20/91
1	1MW-1W-2-DUP	6/19/91	C	WATER	18794-002	X	X	X	X			6/20/91
1	1MW-2W-2	6/19/91	C	WATER	18794-003	X	X	X	X			6/20/91
1	1MW-3W-2	6/19/91	C	WATER	18794-004	X	X	X	X			6/20/91
3KGD	1BK-1W-2	6/19/91	C	WATER	18794-005	X	X	X	X	X		6/20/91
3	3MW-1W-2	6/19/91	C	WATER	18794-006	X	X			X	X	6/20/91
3	3BK-1W-2	6/19/91	C	WATER	18794-007	X	X	X	X	X		6/20/91
QC	ERB6-19	6/19/91	C	WATER	18794-008	X	X	X	X	X		6/20/91
QC	Trip Blank	6/19/91	C	WATER	18794-009	X				X		6/20/91

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTED TO LAB
QC	FB5-17A	05/17/91	C	WATER	18582-001	X	X	X				05/18/91
QC	FB5-17B	05/17/91	C	WATER	18582-002	X	X	X				05/18/91
QC	TRAVEL BLANK	05/17/91	C	WATER	18582-003	X						05/18/91
BKGD	2BK-1W-1	05/20/91	C	WATER	18589-001	X	X			X	X	05/21/91
2	2MW-5W-1	05/20/91	C	WATER	18589-002	X	X			X	X	05/21/91
QC	ER5-20	05/20/91	C	WATER	18589-003	X	X			X	X	05/21/91
QC	FB5-20A	05/20/91	C	WATER	18589-004	X	X			X	X	05/21/91
QC	FB5-20B	05/20/91	C	WATER	18589-005	X	X			X	X	05/21/91
QC	TRAVEL BLANK	05/20/91	C	WATER	18589-006	X						05/21/91
2	2MW-4W-1	05/21/91	C	WATER	18598-001	X	X			X	X	05/22/91
2	2MW-3W-1	05/21/91	C	WATER	18598-002	X	X			X	X	05/22/91
2	2MW-1W-1	05/21/91	C	WATER	18598-003	X	X			X	X	05/22/91
QC	ER5-21	05/21/91	C	WATER	18598-004	X	X			X	X	05/22/91
QC	TRAVEL BLANK	05/21/91	C	WATER	18598-005	X				X		05/22/91
2	2MW-6W-1	05/22/91	C	WATER	18605-001	X	X	X		X		05/23/91
2	2MW-6W-1DUP	05/22/91	C	WATER	18605-002	X	X	X		X		05/23/91
2	2MW-2W-1	05/22/91	C	WATER	18605-003	X	X	X		X		05/23/91
QC	ER5-22	05/22/91	C	WATER	18605-004	X	X	X		X		05/23/91
QC	TRAVEL BLANK	05/22/91	C	WATER	18605-005	X						05/23/91
2	2MW-1	6/17/91	C	WATER	18771-001	X	X			X	X	6/18/91
2	2MW-2	6/17/91	C	WATER	18771-002	X	X			X	X	6/18/91
QC	FB6-17	6/17/91	C	WATER	18771-003	X	X	X		X		6/18/91
QC	ER6-17	6/17/91	C	WATER	18771-004	X	X	X		X		6/18/91
QC	Trip Blank	6/17/91	C	WATER	18771-005	X				X		6/18/91
2	2MW-3W-2	6/18/91	C	WATER	18785-001	X	X			X	X	6/19/91
2	2MW-4W-2	6/18/91	C	WATER	18785-002	X	X			X	X	6/19/91
2	2MW-5W-2	6/18/91	C	WATER	18785-003	X	X			X	X	6/19/91
2	2MW-6W-2	6/18/91	C	WATER	18785-004	X	X			X	X	6/19/91
QC	ERB6-18	6/18/91	C	WATER	18785-005	X	X	X		X		6/19/91
2	2BK-1W-2	6/18/91	C	WATER	18785-006	X	X			X		6/19/91
2	2BK-1W-2	6/18/91	C	WATER	18785-007	X	X			X		6/19/91
QC	Trip Blank	6/18/91	C	WATER	18785-008	X				X		6/19/91

GULFPORT ANG
FIELD EFFORT
DATA INVENTORY
07-Aug-91

SITE	FIELD SAMPLE ID	DATE SAMPLED	QC LEVEL	MATRIX	MGM LAB NUMBER	VOC CLP	SV CLP	TOTAL METALS	SOLUABLE METALS	EDB	PB	DATE SUBMITTED TO LAB
1	1MW-1W-2	6/19/91	C	WATER	18794-001	X	X	X	X			6/20/91
1	1MW-1W-2-DUP	6/19/91	C	WATER	18794-002	X	X	X	X			6/20/91
1	1MW-2W-2	6/19/91	C	WATER	18794-003	X	X	X	X			6/20/91
1	1MW-3W-2	6/19/91	C	WATER	18794-004	X	X	X	X			6/20/91
BKGD	1BK-1W-2	6/19/91	C	WATER	18794-005	X	X	X	X	X		6/20/91
3	3MW-1W-2	6/19/91	C	WATER	18794-006	X	X			X	X	6/20/91
3	3BK-1W-2	6/19/91	C	WATER	18794-007	X	X	X	X	X		6/20/91
QC	ERB6-19	6/19/91	C	WATER	18794-008	X	X	X	~~X~~	X		6/20/91
QC	Trip Blank	6/19/91	C	WATER	18794-009	X				X		6/20/91

Attachment 2
DATA VALIDATION WORKSHEETS

DATA VALIDATION

CASE: 18463 **SITE:** 3 **ANALYSIS:** VOA

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/1 - Ext. 5/6 = 5 days

NUMBER OF SAMPLES: **Soil** 3 **Water** 2 includes 1 ER 1 TRIP

CALIBRATION

Initial: RRF of 2-Hexanone (0.274), 2-Butanone (0.171) + 4-Methyl-2-Pentanone (0.170) > Functional Guidelines QC limit (0.05)-(

Continuing: %D of Chloromethane 70, Acetone -83.3, Bromomethane -26 for 5. Chloromethane 26.8 Bromomethane -27.6 for 5/13 - flag all positive results "J"

COEFFICIENT: NA BLANKS - (SOIL) MeCl 12B, Acetone 15B, 2-Hexanone 4-Me-2-Pentanone 3 B(

BLANKS (SOIL-SM) - Chloromethane 1200BJ, MeCl 570BJ, Acetone 1700B, 2-Butanone 1100

Method: (W) - MeCl 2BJ, Acetone 11B, 2-Hexanone 2BJ, 4-Me-2-Pentanone 2B

Field: MeCl 9B, Acetone 9BJ, CS_2 10

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: LCS Surrogate recovery chart for Toluene-d8 on 5/14 - out. However, Surrogate Recovery on Forms 2A + 2B are OK - No action taken.

SUMMARY:

Mass spectrum for chloromethane - 001 - not a good background subtraction

DATA VALIDATION

CASE: 18463 SITE: 3 ANALYSIS: SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/1 - Ext 5/2 = 1 day

NUMBER OF SAMPLES: Soil 3 Water 1 includes 1 ER

CALIBRATION

Initial: Benzoic acid 39.9 % RSD for 2/17

Continuing: Benzoic acid 75 % D for 5/8 and 36.8 for 5/10
- flag all positive results "J"

COEFFICIENT: Not found

BLANKS (Soil) Di-n-Butylphthalate 88 BJ, Bis(2-Ethylhexyl)phthalate 96

Method: (water) Di-n-Butylphthalate 2 BJ

Field: No hits

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: Soil W/ 18551 for samples 001, 002 + 003. -OK Water W/ 18539 for 004

INTERNAL STANDARDS: OK TUNING: OK

OTHER: LCS - OK

SUMMARY:

MS/MSD for water-004 w/ 18539. 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene % RPD out but LCS OK - no flags

DATA VALIDATION

CASE: 18463 SITE: 3 ANALYSIS: INORG

LAB NOTES: QC W/ 18521

HOLDING TIMES: Samp 5/1 - Prep. 5/14 = 13 days

NUMBER OF SAMPLES: Soil 3 Water 1 includes 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: N/A

BLANKS

Method: Pb 0.7B, Ag 4.4B, Ba 1.8B, As 0.9B, Se 1.6

Field: Ba 1.9B, Pb 2.4B

FIELD DUPLICATES: None

SURROGATES: N/A

MS/MSD: Prespike & Postspike - OK

INTERNAL STANDARDS: N/A TUNING: N/A

OTHER: ICS - OK

LCS - OK CONTROL CHARTS - OK

SUMMARY: Results of Lab Dups for Ba & Pb are out (48.0% RPD & 56.7% RPD). However, both are below CRDL. No action was taken.

DATA VALIDATION

CASE: 18470 **SITE:** Backgrand **ANALYSIS:** VOA

LAB NOTES: TICs not requested.
Medium level protocol not performed; therefore, extraction time not applicable.

HOLDING TIMES: Samp 5/2 - Analyzed 5/15 = 13 days

NUMBER OF SAMPLES: Soil 2 includes 1 Dup Water 1 includes 1 TRIP

CALIBRATION

Initial: OK

Continuing: Chloromethane 26.8 %D, Bromomethane -27.6 for 5/13 however, no positive results - no action taken

COEFFICIENT: Not found.

BLANKS (soil) MeCl 8B, Acetone 15B

Method (W) MeCl 2BJ, Acetone 10B, 2-Hexanone 1BJ, 4-Methyl-2-Penta 2

Field: MeCl 3BJ, Acetone 5BJ

FIELD DUPLICATES: 001 + 002 - good correlation

SURROGATES: OK

MS/MSD: soil w/ 18463-OK, water w/ 18539

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: LCS Surrogate Recovery chart for Toluene-d8 on 5/14 - out. However, Surrogate Recovery on Forms 2A + 2B are OK - No action.

SUMMARY:
MS/MSD for water w/ 18539 - Toluene %R out (72%), but LCS OK. no flags.

DATA VALIDATION

CASE: 18470 **SITE:** Backgrand **ANALYSIS:** SVOC

LAB NOTES: TICs not requested.

001 + 002 were spiked w/ twice the normal level of surrogate std.

HOLDING TIMES: Samp. 5/2 - Ext 5/6 = 4 days

NUMBER OF SAMPLES: **Soil** 2 **Water** —

CALIBRATION

Initial: Benzoic acid 39.9 % RSD for 2/17 - not found in samples

Continuing: bis (2-Chloroisopropyl) Ether -36.7 % D, N-Nitroso-di-n propylamine -35.2, Benzoic â 36.8, Hexachlorocyclopentadiene 49.1 for 5/10 - not found in samples - no act

COEFFICIENT: NA

BLANKS

Method: Di-n-Butylphtalate 79BJ, bis (2-Ethylhexyl) phthalate 55B

Field: —

FIELD DUPLICATES: 001 + 002 - fairly good correlation

SURROGATES: OK

MS/MSD: W/ 18551 - OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: LCS - OK

SUMMARY:

DATA VALIDATION

CASE: 18470 SITE: Background ANALYSIS: INORG

LAB NOTES: QC w/ 18521

HOLDING TIMES: Samp. 5/2 - Hg prep date 5/14 = 12 days

NUMBER OF SAMPLES: Soil 2 Water -

CALIBRATION
Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS
Method: Pb 0.7B, Ag 4.4B, K 1.6B

Field: No field blanks

FIELD DUPLICATES: 001 + 002 - fairly good correlation (found Cr in C but not in 001

SURROGATES: NA

MS/MSD: w/ 18521 - OK

INTERNAL STANDARDS: NA TUNING: NA

OTHER: ICS - OK
LCS - OK control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18483 **SITE:** QC Blanks **ANALYSIS:** VOA

LAB NOTES: TICs not requested

Medium level protocol was not performed; therefore,

extraction time is not applicable MS/MSD w/ 18471 - as we don't have a package with this number - we are using 18598 for ms/ms.

HOLDING TIMES: Samp 5/2 - Analysis 5/15 = 13 days

NUMBER OF SAMPLES: Soil — Water 4 includes 2 FB 1 ER 1 TRIP

CALIBRATION
Initial: OK

Continuing: Chloromethane 39.8 %D for 5/15 - not found in samples - no action.

COEFFICIENT: NA

BLANKS
Method: MeCl 5B, Acetone 6BJ

Field: MeCl 12B, Acetone 10B, Chloroform 3J, Bromodichloromet 2. Dibromochloromethane 2J

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: ~~W/ 18471~~ No Problems w/ MS/MSD for 18598

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: LCS control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18483 **SITE:** Blanks **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

Reanalyzed 003 due to one acid surrogate below QC limits

possibly from matrix effect.

HOLDING TIMES: Sampling 5/2 – Ext 5/6 = 4 days

NUMBER OF SAMPLES: **Soil** – **Water** 3 includes 2 FB 1 ER

CALIBRATION

Initial: Benzoic â for 2/17 was 39.9 % RSD – not found in samples.

Continuing: bis (2-chloroisopropyl) Ether, N-Nitroso-di-n-propylamine Benzoic a , 2-Methylnapthalene -out – not found in samples

COEFFICIENT: NA

BLANKS

Method: No hits

Field: No hits

FIELD DUPLICATES: None

*

SURROGATES: Rerun of 003 still out – flag all positive results "J"

MS/MSD: W/18539 – 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene % RPD out but LCS ok no flag

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts – ok

SUMMARY:

DATA VALIDATION

CASE: 18483 **SITE:** Blanks **ANALYSIS:** INORG

LAB NOTES: Hg QC w/ 18463

HOLDING TIMES: Samp 5/2 - Hg prep date 5/16 = 14 days

NUMBER OF SAMPLES: Soil - Water 3 includes 2 FB 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: Ba 1.3B, Pb 2B, Ag 4.4B, As 0.9B, Se 1.6B

Field: Ba ~~7.6~~ 9.9 B, Pb 14.7, Cd 9.6

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: Pre + Postspike - OK

INTERNAL STANDARDS: NA **TUNING:** N/A

OTHER: ICS - OK

LCS - OK control charts - OK

SUMMARY: Lab Dups for Cr - out - not found in samples - no action

DATA VALIDATION

CASE: 18505 SITE: 1 ANALYSIS: VOA

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/7 - Ext 5/16 = 9 days

NUMBER OF SAMPLES: Soil 8 Water 6 includes 1 ER
2 TRIP

CALIBRATION
Initial: OK

Continuing: Acetone -28.9%D, Trichloroethene -26.9%D for 5/16
flag all positive results "J" [Chloromethane-out for 5/17 + 5/18, howev
not found in sample:

COEFFICIENT: NA

BLANKS (soil) MeCl 6B, Acetone 20B, 2-Hexanone 5BJ, 4-Meth-2-Pent 3BJ
Method: (SM) Chloromethane 1200 BJ, MeCl 1000 BJ, Acetone 1200 BJ, 2-Buta 84
Trichloroethene 150BJ
Field: MeCl 7B, Acetone 11B, CS_2 2 BJ 2-Hexanone 320 B
4-Meth-2-Penta 31

FIELD DUPLICATES: 006 & 007, 010 + 011 - fairly good correlations.

SURROGATES: OK

MS/MSD: Soil w/ 18463-OK, water w/ 18539 - Toluene %R (72%) out
but LCS OK,
no fla

INTERNAL STANDARDS: OK TUNING: OK

OTHER: LCS control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18505 **SITE:** 1 **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/7 - Ext 5/9 = 2 days

NUMBER OF SAMPLES: Soil 8 Water 4 includes 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: NA

BLANKS

Method: (5-2) (3) Di-n-Butylpthalate 37 BJ 41 BJ, bis (2-Ethylhexyl) phthalate 6C 52

Field: No hits

FIELD DUPLICATES: 006 + 007, 010 + 011 - fairly good correlations.

SURROGATES: One surrogate for each of 006, 007 + 001 - out; No action take

MS/MSD: water w/ 18539, soil w/ 18551-OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: surrogate recovery charts - OK

SUMMARY:

MS/MSD for water w/ 18539 - 1,4 - Dichlorobenzene + 1,2,4 - Trichlorobenzene % RPD out but LCS-OK, no flags.

DATA VALIDATION

CASE: 18505 **SITE:** 1 **ANALYSIS:** INORG

LAB NOTES: Soil QC w/ 18521 - OK

Soil Hg QC w/ 18463

HOLDING TIMES: Samp 5/7 - Hg prep 5/14 = 7 days

NUMBER OF SAMPLES: Soil 8 **Water** 4 includes 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: Se ~~0.9~~ 1.8 B, Pb 1.3 B, K 1.2 B, Ag 9.7 B

Field: Ba 6.6 B, Cd 5.4, Se 2.8 B

FIELD DUPLICATES: 006 + 007, 010 + 011 - fairly good correlation

SURROGATES: N/A

MS/MSD: pre + post spike - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - OK

LCS - OK control charts - OK

SUMMARY: Lab Dups for Pb out but conc. < 5 x CRDL - No action take

DATA VALIDATION

CASE: 18521 SITE: Background ANALYSIS: VOA

LAB NOTES: TICs not requested

Medium level protocol not performed, therefore extraction time not applicable

HOLDING TIMES: Analysis 5/20 - Samp 5/8 = 12 days

NUMBER OF SAMPLES: Soil 1 Water 3 includes 2 ER 1 TRIP

CALIBRATION

Initial: OK

Continuing: No hits in samples have corresponding %D or RRF50 out of control limits.

COEFFICIENT: NA

BLANKS

Method: MeCl 7B, Acetone 9BJ, 2-Hexanone 2BJ, 4-Methyl-2-Peta

Field: MeCl ~~6B~~ 17B, Acetone ~~5BJ~~ 10B, Chloroform 90, Bromodichlorome. Dibromochloromethane 1J

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: Soil w/ 18463, Water w/ 18539

INTERNAL STANDARDS: OK TUNING: OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

MS/MSD for water w/ 18539: Toluene %R out (72%) but LCS OK, no flags.

DATA VALIDATION

CASE: 18521 **SITE:** Background **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Ext 5/10 - Samp 5/8 = 2 days

NUMBER OF SAMPLES: Soil 1 Water 2 includes 2ER

CALIBRATION
Initial: Benzoic acid 39.9 % RSD for 2/17

Continuing: Benzoic acid 76.4 % D for 5/13, however, was not Ext. or Analysis Dates for samples - No action

COEFFICIENT: NA

BLANKS
Method: (W) + (S) - No hits.

Field: No hits

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: Soil w/ 18551 - OK, water w/ 18539

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:
MS/MSD for water w/ 18539: 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene % RPD out but LCS OK, no flags.

DATA VALIDATION

CASE: 18521 **SITE:** Background **ANALYSIS:** INORG

LAB NOTES: Water QC w/ 18505 - OK

Soil Hg QC w/ 18463 - OK

HOLDING TIMES: Samp 5/8 - Hg prep Date 5/20 = 12 days

NUMBER OF SAMPLES: Soil 1 Water 2 includes 2 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: Pb 1 B, Ag 4.7 B

Field: Ba 14.5 B, Cd 7, Pb ~~54~~ 31.5, Cr 3.4 B

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: Prespike + Postspike - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - OK

LCS - OK control charts - OK

SUMMARY: Lab Dup for Pb out but conc < 5x CRDL

- No action taken

DATA VALIDATION

CASE: 18531 **SITE:** Blanks **ANALYSIS:** VOA

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/9

NUMBER OF SAMPLES: Soil – Water 2 includes 1 FB 1 TRIP

CALIBRATION

Initial: OK

Continuing: Bromomethane + Chloroethane out for 5/20, not found in samples - no action

COEFFICIENT: NA

BLANKS

Method: MeCl 3BJ, Acetone 8BJ, 2-Hexanone 2BJ, 4-Methyl-2-Pentanone 3BJ

Field: MeCl 3BJ, Acetone 10B

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: w/ 18539: Toluene %R out (72%) but LCS ok, no fla

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18531 **SITE:** Blanks **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Samp 5/9 - Ext 5/13 = 4 days

NUMBER OF SAMPLES: Soil — Water 1 includes 1 FB

CALIBRATION

Initial: OK

Continuing: 2,4-Dinitrophenol, Dibenzofuran, 4-Nitroaniline, 4,6-Dinitro-2-Methyphenol, Di-n-Butylphthalate, Butylbenzylphthalate, 3,3'-Dichlorobenzidine - OUT. not found in samples - no act

COEFFICIENT: NA

BLANKS

Method: 2,4-Dimethyphenol 3 BJ, bis(2-Ethylhexyl) phthalate 2B

Field: No hits

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: W/ 18539 : % RPD out for 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene but LCS OK no flag

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18531 **SITE:** Blanks **ANALYSIS:** INORG

LAB NOTES: QC w/ 18505

HOLDING TIMES: Hg prep date 5/20 - Sampling date 5/9 = 11 dc

NUMBER OF SAMPLES: Soil - **Water** 1 includes 1 FB

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: not found

BLANKS

Method: Pb 1.6B, As 0.8B, Ag 9.7B

Field: Ba 10.3B, Cd 4.6B, Pb 1.6B

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: w/ 18505

INTERNAL STANDARDS: N/A **TUNING:** N/A

OTHER: ICS - OK

LCS - OK control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18539 SITE: 3, Background ANALYSIS: VOA

LAB NOTES: TICs not requested

% R for Toluene in samples M02 + D02 - out. But

% RPD - in. Lab took no further action

HOLDING TIMES: Sampling date 5/10 - Analysis 5/20 = 10days

NUMBER OF SAMPLES: Soil - Water 6 includes 2 ER

1 TRIP

CALIBRATION

Initial: OK

Continuing: Bromomethane, Chloroethane, Vinyl acetate

for 5/18 + 5/20 - out, however, no hits, no action taken.

COEFFICIENT: NA

BLANKS

Method: MeCl 3 BJ, Acetone 8 BJ, 2-Hexanone 2BJ, 4-Methyl-2-Pentanone 3

Field: MeCl 7B, Acetone 11B, Carbon Disulfide 2J

FIELD DUPLICATES: 001 + 002 - fairly good correlation

SURROGATES: OK

MS/MSD: Toluene % R - out (72% R) but LCS - OK - no action tal

INTERNAL STANDARDS: OK TUNING: OK

OTHER: Control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18539 **SITE:** 3, Background **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

Sample 005 - 2 acid surrogates out, reanalyze w/ same results, may be m eff

% RPD for 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene out for MO2 + 002.)

HOLDING TIMES: Ext. date 5/14 - Samp date 5/10 = 4 days %R i

NUMBER OF SAMPLES: **Soil** – **Water** 5 includes 2 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: NA

BLANKS

Method: Di-n-Butylphthalate 4 BJ

Field: No hits

FIELD DUPLICATES: 001 + 002 - very good correlation

SURROGATES: Sample 005 - two acid surrogates - out - flag "J" all pos (resul

MS/MSD: 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene % RPD out but LCS OK - no action taken

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Control charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18539 **SITE:** 3, Background **ANALYSIS:** INORG

LAB NOTES: No problems

HOLDING TIMES: Samp. date 5/10 - Hg prep date 5/20 = 10 days

NUMBER OF SAMPLES: Soil — Water 5 includes 2 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: NA

BLANKS

Method: As 1B, Se 1.8B

Field: As 0.96B, Ba 6 B, Cd 3.1 B, Pb 5.9, Se 2.6 B

FIELD DUPLICATES: 001 + 002 - fairly good correlation

SURROGATES: NA

MS/MSD: Prespike for Pb + Ag - out. Postspike - ok. No action

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - OK

LCS - OK Control charts - OK

SUMMARY: Results of Lab Dups for Pb + Cd are out (112.6 + 37.3 % RPD). However, both are below CRDL, no action was taken.

DATA VALIDATION

CASE: 18551 **SITE:** 1, 2, Background **ANALYSIS:** VOA

LAB NOTES: no TICs requested

no problems

HOLDING TIMES: analysis date 5/21 - sampling date 5/14 = 7 days

NUMBER OF SAMPLES: Soil 2 **Water** 4 includes - 1 ER
1 TRIP

CALIBRATION

Initial: ok

Continuing: over 25% for Chloromethane, Acetone, 1,2-DCA, CCl_4, VAcetate, 2-Hexanone, MIBK

Flag hits for Acetone MIBK with J; no flags for non-hits

COEFFICIENT: NA

BLANKS

Method: Water MeCl 2J, 2 Hexanone 2BJ; MIBK 2BJ
Soil - MeCl 8B, Acetone 22B, Toluene 1BJ

Field: MeCl 8B; Acetone 9J; Chloroform 1J; MIBK 6BJ

FIELD DUPLICATES: -001 and -002 - good correlation

SURROGATES: Soil - ok water - OK

MS/MSD: water - ok soil - ok

INTERNAL STANDARDS: ok **TUNING:** tuning = OK

OTHER: Surrogate chart - ok

SUMMARY:

DATA VALIDATION

CASE: 18551 SITE: 1, 2. Background ANALYSIS: SVOC

LAB NOTES: TICs not requested

no problems

HOLDING TIMES: Extraction date 5/15 - Sampling date 5/14 = 1 day

NUMBER OF SAMPLES: Soil 2 Water 3 includes 1 ER

CALIBRATION

Initial: ok

Continuing: ok

COEFFICIENT: NA

BLANKS

Method: ~~Soil~~ water - di-n-butyl ph 4BJ ; soil - nothing found

Field: BEHP = 3J

FIELD DUPLICATES: -001 and -002 - very good correlation

SURROGATES: water - ok (lower than soil) Soil - OK

MS/MSD: for water w/ 18539 for soil (included) - ok

INTERNAL STANDARDS: ok TUNING: OK

OTHER: control charts - ok soils ok water

SUMMARY:

MS/MSD for water w/ 18539 : 1,4-Dichlorobenzene +

1,2,4- Trichlorobenzene % RPD out but LCS ok - no flags

DATA VALIDATION

CASE: 18551 **SITE:** 1, 2, Background **ANALYSIS:** Inorg.

LAB NOTES:

HOLDING TIMES: Hg prep date. 5/20-21 — sampling date 5/14 = 7 days

NUMBER OF SAMPLES: Soil 2 Water 3 includes 1 ER

CALIBRATION

Initial: ok

Continuing: ok

COEFFICIENT: Not found

BLANKS

Soil - As 1.0B; Pb 0.7B

Method: Water As - 0.8B, Pb 0.6B. Se 1.5B

Field: Ba 5.1B; Cd 3.9B; Pb 2.7B

FIELD DUPLICATES: -001 and -002 — -002 concentrations were higher

SURROGATES: NA

MS/MSD: water in 18539; soil included: out for lead, but sample conc. exceeds spike conc by >4 x. no action

Post-dig. spike ok

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - ok LCS - ok

lab dup out for Cd but results was below CRDL, so no action taken

SUMMARY:

MS/MSD for water w/ 18539: Prespike out for Pb + Ag, post spike OK, no action.

DATA VALIDATION

CASE: 18560 SITE: 1 + 2 ANALYSIS: VOA

LAB NOTES: TICs not requested -008 = xylenes by 2nd ary ion quant.
-008 and -013 (+ its spike + dup) were out of range -008 and -013 were reanalyzed
Soil ms/msD ok ; water MS/MSD w/ 18539 blank cont. problems

HOLDING TIMES: 5/23 - 5/15 = 7 days reg. samples; diluted samples 5/23 - 5/15 = 7 days
analysis - sampling ext - samp.

NUMBER OF SAMPLES: Soil 10 Water 4 includes 1 ER
1 Trip soil
1 Trip water

CALIBRATION
Initial: water - ok soil - Chloromethane 43.5 MeCl 37.9
Acetone 32.5 2-Butanone 30.9 - Flag all hits "J"

Continuing: Water - Chloromethane 35.5 %D ; Acetone 28.8 %R 1,2 DCA 35.3 %D
no new flags for water as pertinent results already have J
Soil - no flags for diluted samples; regular samples: chloromethane 43.5 %D,

COEFFICIENT: MeCl 37.9 %D; Acetone 32.5 %D, 2-Butanone 30.9 %D - no new flags as same cmpds as I.C.

BLANKS
(1) Water - MeCl 2 BJ ; 2-Hexanone 2 BJ ; MIBK 3 BJ
(2) Soil MeCl 12 B Acetone 9 BJ " 2 BJ ; " 3 BJ
Method: (3) -006 and dil. TCE found
ER - MeCl 12 B ; Acetone 8 J ; CS_2 9
Field: Trip for soil - MeCl 11 B ; Acetone 9 J
Trip for water - " 12 B ; " 9 J

FIELD DUPLICATES: -012 and -013

SURROGATES: ok water ok soil ok diluted

MS/MSD: ok - reg ok med

INTERNAL STANDARDS: water oK ; soil ok TUNING: ok

OTHER:

SUMMARY: Lab did not list the correct dilution factor on Form I - I calculated the probable dilution factor from the non-detects and the D.L. (x6 for -008)

DATA VALIDATION

CASE: 18560 **SITE:** 1 and 2 **ANALYSIS:** SVOC

LAB NOTES: No tics requested, surr. %R 1/fraction may be out

Acenaphthene RPD for spike + dup out

water MS/MSD ^a-001^ w/ 18539 · -002-5 w/ 18551 · water -009 w/ 18598

HOLDING TIMES: ext 5/17 - sampling 5/15 = 2 days. (6-8 and 12-14 with this pkg.)

NUMBER OF SAMPLES: Soil 10 **Water** 2 includes 1 ER

CALIBRATION

Initial: 5/17 · Benzoic Acid 39.9% RSD 5/21 - no problem

↑ not found in samples - no flags

Continuing: 2-Methylphenol 45.5%D 2-methylphenol 27%D, Benzoic Acid Benzo [K] fluoranthene 46 / 2-4 Dinitrophenol 47.8

Benzyl Alcohol 28.4%D — all hits already have J

COEFFICIENT:

BLANKS

Soil (all but -006) · BEHP - 71BJ ; (-006 BEHP · 75BJ

Method: water - no hits

Field: ER - no hits

FIELD DUPLICATES: -012 + -013 - no hits in -012 - 4 hits in -013 all below CRQL

SURROGATES: water - 1 out - no action soil - ok

MS/MSD: 1 out Acenaphthene 21% RPD - 1 sample result already has a J

INTERNAL STANDARDS: ok **TUNING:** ok

OTHER: Lab initial calib date listed as 2/17 on Form 6B - Assume correct date to be 5/17

SUMMARY: LCS - ok

MS/MSD for soil -002 thru -005 w/ 18551 - OK

MS/MSD for water -009 w/ 18598 - OK

MS/MSD for water -001 w/ 18539 : 1,4-Dichlorobenzene + 1,2,4-Trichlorobenzene %RPD out but LCS ok - no action

DATA VALIDATION

CASE: 18560 SITE: 1 + 2 ANALYSIS: INORG

LAB NOTES: no problems

HOLDING TIMES: Hg prep date - 5/22 — sampling date 5/15 = 7 days

NUMBER OF SAMPLES: Soil 10 Water 2 includes 1 ER

CALIBRATION
Initial: ok

Continuing: ok

COEFFICIENT: not found

BLANKS
Method: water - As 1.2 B Pb 1.0 B
soil - As 1.0 B Se 1.5 B

* Field: ER - Ba 4.2 B; Cd 3.3 B; Cr 5.0 B; Pb 5.2

FIELD DUPLICATES: -012 and -013 - good correlation
Lab " - Cr + Pb high but results below CRDL so no action taken for water + soluble

~~SURROGATES~~: Pb dup for soil was 41.6 RPD, but results were < 5x CRDL so no action taken.

MS/MSD: water - ok
Soil - As, Pb + Se out - Results > IDL flagged "J" - see summary below

INTERNAL STANDARDS: NA TUNING: NA

OTHER: ICS - ok

LCS - ok

SUMMARY: Soil Pre-spike (MS) for As (29.9% R) and Pb (-7.6% R) are < 30% R

DATA VALIDATION

CASE: 18572 SITE: 1 + 2 - Background ANALYSIS: VOA

LAB NOTES: no TICs requested

lab contam. in diluted samples

HOLDING TIMES:

NUMBER OF SAMPLES: Soil 3 Water 3 includes 1 ER
1 TRIP

CALIBRATION
Initial: ok

Continuing: Chloromethane 35.2%D Acetone 44.7%D
J for positives

COEFFICIENT: NA

BLANKS
VBLKS (soil) - MeCl 18B; Acetone 31B; 2-But 9BJ; 2-Hex 3BJ MIBK. 3BJ
Method: VBLKW (water) - MeCl 2BJ; Acetone 19B. 2-But 5BJ; Xylenes 2BJ

Field: ER - MeCl 8B; Acetone 8BJ; CS2. 5 | Trip - MeCl 6B Ace. 5BJ

FIELD DUPLICATES: none

SURROGATES: Soil ok water ok

MS/MSD: w/ 18551 - OK

INTERNAL STANDARDS: ok TUNING:

OTHER: It appears that -005 was diluted although lab says dilution factor of 1.0 on Form I - I am assuming 6x

SUMMARY:

DATA VALIDATION

CASE: 18572 SITE: 1, 2, Background ANALYSIS: SVOC

LAB NOTES: no TICs requested

HOLDING TIMES: Ext. 5/17 - 5/16 sampling = 1 day!

NUMBER OF SAMPLES: Soil 3 Water 2 includes 1 ER

CALIBRATION

Initial: Benzoic Acid 39.9

Continuing: 2 Methyl Phenol 45.5 Benzoic Acid 71.5 2-4-Dinitroph. 47.8
4-Nitrophenol - 29.6 ; 4,6-Dinitro-2-methylph 45.8 · 3,3'Dichlorobenzidine 31.7
Benzo [K] fluoranthene 66.6 Benzyl alcohol 28.4

COEFFICIENT: NA

BLANKS

Method: water no hits soil BEHP 75BJ

Field: ER - no hits

FIELD DUPLICATES: none

SURROGATES: ok soil ok water

MS/MSD: water w/ 18598 - OK , soil w/ 18560

INTERNAL STANDARDS: ok TUNING: ok

OTHER: LCS - ok

SUMMARY:

MS/MSD for soil w/ 18560: Acenapthene % RPD out (21%) but LCS ok, no action.

DATA VALIDATION

CASE: 18572 SITE: 1, 2, Background ANALYSIS: INORG.

LAB NOTES: pre-spike + duplicate problems flagged

HOLDING TIMES: Hg 5/22 Prep - sampling date 5/16 = 6 days

NUMBER OF SAMPLES: Soil 3 Water 2 includes 1 ER

CALIBRATION

Initial: ok

Continuing: ok

COEFFICIENT: not found

BLANKS

Method: Water - As 1.0B Pb 1.0B

Soil As 0.9B Se 1.5B

Field: ER - As 1.1B, Ba 103B · Cr 3.2B ; Pb 12.6

FIELD DUPLICATES: none

SURROGATES: NA

MS/MSD: in 18560

INTERNAL STANDARDS: NA TUNING: NA

OTHER: ICS - ok

water LCS ok soil LCS - ok except for Se 62%R

check ms

SUMMARY:

MS/MSD for water w/ 18560 - OK

MS/MSD for soil w/ 18560 : As (29.9%R), Pb (-7.6%R) & Se out (<30%R) - Results > IDL flagged "J".

DATA VALIDATION

CASE: 18582 SITE: QC ANALYSIS: VOA

LAB NOTES: TICs not requested

no problems

HOLDING TIMES: Analysis date 5/30 - Sampling date 5/17 = 13 days

NUMBER OF SAMPLES: Soil — Water 3 includes 2 FB 1 TRIP

CALIBRATION

Initial: ok

Continuing: chloromethane 34.4 %D - no hits ∴ no action

CS2 25.8 %D " " " "

COEFFICIENT:

BLANKS

Method: 5/29 MeCl - 3 BJ Acetone 5 BJ

5/30 " - 4 BJ " 8 BJ

Field: Trip - 11 B Acetone MeCl 6B ; Field Acetone 9 BJ MeCl 24 B

FIELD DUPLICATES: None

SURROGATES: ok

MS/MSD: w/ 18551 - OK

INTERNAL STANDARDS: ok TUNING: ok

OTHER:

SUMMARY:

DATA VALIDATION

CASE: 18582 SITE: QC ANALYSIS: SVOC

LAB NOTES: no TICs requested

no problems

HOLDING TIMES: Ext 5/20 - Samp 5/17 = 3 days

NUMBER OF SAMPLES: Soil — Water 2 includes 2 FB

CALIBRATION

Initial ok

Continuing: ok

COEFFICIENT: NA

BLANKS

Method: no hits

Field: no hits

FIELD DUPLICATES: None

SURROGATES: ok

MS/MSD: w/ 18598 - OK

INTERNAL STANDARDS: ok TUNING: ok

OTHER:

SUMMARY:

DATA VALIDATION

CASE: 18582 SITE: QC ANALYSIS: INORG

LAB NOTES: no problems

HOLDING TIMES: Hg prep date = 5/22 – Sampling date 5/17 = 5 days

NUMBER OF SAMPLES: Soil — Water 2 Includes 2 FB

CALIBRATION
Initial: ok

Continuing: ok

COEFFICIENT: Not found

BLANKS
Method: As 1.0B Ba – Pb 1.0B

Field: Pb 1.9B Ba 11.1B As 1.0B

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: w/ 18560 – OK

INTERNAL STANDARDS: NA TUNING: NA

OTHER: ICS – ok
LCS – ok

SUMMARY:

DATA VALIDATION

CASE: 18589 **SITE:** 2, Background **ANALYSIS:** VOA

LAB NOTES: TICs not requested.

HOLDING TIMES: Analysis date 5/30 - Samp date 5/20 = 10 days

NUMBER OF SAMPLES: Soil — Water 6 includes 1 ER
2 FB
1 TRIP

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: NA

BLANKS

Method: MeCl 4BJ, Acetone 8BJ

Field: MeCl 17B, Acetone 8BJ, CS_2 6

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: (results for -001 thru -004 w/ 18598) - OK
-005 thru -006 w/ 18551 - OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18589 SITE: 2, Background ANALYSIS: SVOC

LAB NOTES: TICs not requested.

HOLDING TIMES: Extract date 5/21 - Samp date 5/20 = 1 day

NUMBER OF SAMPLES: Soil — Water 5 includes 1 ER 2 FB

CALIBRATION

Initial: 5/17 Benzoic acid out, not found in samples - no flags

Continuing: Seven elements out on 5/30 - not found in samples

COEFFICIENT: NA

BLANKS

Method: No hits

Field: No hits

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: w/ 18598 - ok

INTERNAL STANDARDS: OK TUNING: OK

OTHER: Surrogate recovery charts - ok

SUMMARY: Assume Initial Calibration Date is 5/17 instead of 2/17 shown on form 6B.

DATA VALIDATION

CASE: 18589 **SITE:** 2, Background **ANALYSIS:** INORG

LAB NOTES: QC W/ 18598

HOLDING TIMES: Prep date 5/24 - Samp date 5/20 = 4 days

NUMBER OF SAMPLES: Soil – Water 5 includes 1ER 2FB

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: -

Field: Pb 6.4

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: w/ 18598 - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: LCS - OK control chart - OK

SUMMARY:

Pb (Total + Soluble) only analyte requested + analyzed for for Site 2 samples

Same data also included w/ 18598 + 18605.

DATA VALIDATION

CASE: 18589 **SITE:** 2, Background **ANALYSIS:** EDB

LAB NOTES: Packed columns were used instead of capillary columns. Pentane was used as extracting solvent. Sample 95184 had two disagreed values, an interferent coeluted w/ EDB in this sample

HOLDING TIMES: Analysis date 6/11 - Samp date 5/20 = 22 days

NUMBER OF SAMPLES: Soil — **Water** 15

CALIBRATION

Initial: % RSD for 6/11 out

Continuing: OK

~~**COEFFICIENT:**~~

BLANKS

Method: Not detected

Field: Not detected

FIELD DUPLICATES: 95182 + 95183 - no hits on either of these sample

SURROGATES: NA

MS/MSD: OK

BLANK SPIKE CONTROL CHART - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: - Method 504 MDL = 0.01 ug/L, Lab used 0.02 ug/L.

- Lab I.D. 95139 Corresponds to -001 2BK-1W-1

SUMMARY:

95139	-001	2BK-1W-1	for 18589
95140	-002	2M-5W-1	for 18589
95141	-003	ERS-20	for 18589
95142	-004	FBS-20A	for 18589
95143	-005	FBS-20B	for 18589
95164	-001	2MW-4W-1	for 18594
95165	-002	2MW-3W-1	for 18594
95166	-003	2MW-1W-1	for 18594
95167	004	ERS-21	for 18594
95168	005	TRIP	for 18594
95182	001	2MW-6W-1	for 186[illegible]
95183	002	2MW-6W-1 DUP	for 186[illegible]
95184	003	2MW-2W-1	for 186[illegible]
95185	004	ERS-22	for 186[illegible]
95186	005	TRIP	for 186[illegible]

DATA VALIDATION

CASE: 18598 **SITE:** 2 **ANALYSIS:** VOA

LAB NOTES: TICs not requested

HOLDING TIMES: Analysis date 6/3 - Samp date 5/21 = 13 days

NUMBER OF SAMPLES: Soil — **Water** 5 includes 1 ER
1 TRIP

CALIBRATION
Initial: OK

Continuing: Chloromethane %D out for 5/29, not found in samples, no action taken.

COEFFICIENT: NA

BLANKS
MeCl 3 BJ Acetone 11B, 2-Hexanone 2BJ, 4-Meth-2-Pent
" 4 BJ " 8 3
Method: MeCl 3BJ, Acetone 5BJ 2-Butanone 9 BJ 2 BJ

Field: MeCl 10B, Acetone 8BJ

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: (results for -003 thru -005 w/ 18551) OK
OK for 001 + 002

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18598 SITE: 2 ANALYSIS: SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Extract date 5/23 - Samp date 5/21 = 2 days

NUMBER OF SAMPLES: Soil — Water 4 includes 1ER

CALIBRATION

Initial: 5/17 - Benzoic acid out, not found in samples - no flags

Continuing: Eight elements out on 5/31, not found in samples.

COEFFICIENT: NA

BLANKS

Method: No hits

Field: No hits

FIELD DUPLICATES: None

SURROGATES: -001 one surrogate out but >10%. - OK

MS/MSD: OK

INTERNAL STANDARDS: OK TUNING: OK

OTHER: Surrogate recovery charts - OK

SUMMARY: Assume Initial Calib. Date on form 6B is 5/17 instead of 2/17.

DATA VALIDATION

CASE: 18598 **SITE:** 2 **ANALYSIS:** INORG

LAB NOTES: No problems

HOLDING TIMES: Prep date 5/24 - Samp date 5/21 = 3 days

NUMBER OF SAMPLES: Soil — Water 4 includes 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: NA

BLANKS

Method: –

Field: Pb 3.1

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: LCS - OK control charts - OK

SUMMARY: Lab Dup for Pb out, flag all positive results "J"

Lab analyzed for Lead (Total) only, as requested by C of C

Same data also included w/ 18589 & 18605

DATA VALIDATION

CASE: 18598 **SITE:** 2, Background **ANALYSIS:** EDB

LAB NOTES: Packed columns were used instead of capillary columns. Pentane was used as extracting solvent. Sample 95184 had two disagreed values, an interferent coeluted w/ EDB in this sample

HOLDING TIMES: Analysis date 6/11 - Samp date 5/20 = 22 days

NUMBER OF SAMPLES: **Soil** — **Water** 15

CALIBRATION
Initial: % RSD for 6/11 out

Continuing: OK

~~**COEFFICIENT:**~~

BLANKS
Method: Not detected

Field: Not detected

FIELD DUPLICATES: 95182 + 95183 - no hits on either of these sample

SURROGATES: NA

MS/MSD: OK

BLANK SPIKE CONTROL CHART - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: - Method 504 MDL = 0.01 ug/L, Lab used 0.02 ug/L.

- Lab I.D. 95139 corresponds to -001 2BK-1W-1

SUMMARY:

95139	-001	2BK-1W-1	for 18589
95140	-002	2M-5W-1	
95141	-003	ERS-20	
95142	-004	FBS-20A	
95143	-005	FBS-20B	
95164	-001	2MW-4W-1	for 1859[illegible]
95165	-002	2MW-3W-1	
95166	-003	2MW-1W-1	
95167	004	ERS-21	
95168	005	TRIP	
95182	001	2MW-6W-1	for 1860[illegible]
95183	002	2MW-6W-1 DUP	
95184	003	2MW-2W-1	
95185	004	ERS-22	
95186	005	TRIP	

DATA VALIDATION

CASE: 18605 SITE: 2 ANALYSIS: VOA

LAB NOTES: TICs not requested

HOLDING TIMES: Analysis date 6/3 - Samp date 5/22 = 13 days

NUMBER OF SAMPLES: Soil — Water 5 includes 1 ER 1 TRIP

CALIBRATION
Initial: OK

Continuing: OK

COEFFICIENT:

BLANKS MeCl 4 BJ Acetone 9 BJ, 2-Butanone 9 BJ
Method: MeCl 3 BJ, Acetone 11 B, 2-Hexanone 2 BJ, 4-Meth-2-Pen 2 BJ

Field: MeCl 9 B, Acetone 8 BJ, CS_2 1 J

FIELD DUPLICATES: 001 + 002 - very good correlation.

SURROGATES: OK

MS/MSD: w/ 18598 - OK

INTERNAL STANDARDS: OK TUNING: OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18605 **SITE:** 2 **ANALYSIS:** SVOC

LAB NOTES: TICs not requested.
-001 showed 2 surrogates out, re-extraction (outside holding time)
result still out - possibly due to matrix effect problem.

HOLDING TIMES: Extract date 5/23 - Samp date 5/22 = 1 day

NUMBER OF SAMPLES: **Soil** — **Water** 4 includes 1ER

CALIBRATION
Initial: Benzoic â out for 2/17 - not found in samples

Continuing: Some elements out - not found in samples,
no action taken

COEFFICIENT: NA

BLANKS
Method: No hits

Field: No hits

FIELD DUPLICATES: -001 + -002 - fairly good correlation.

SURROGATES: -001 two surrogates out, re-extracted results still out - no hits for in this sam no act take

MS/MSD: w/ 18598 - OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18605 SITE: 2 ANALYSIS: INORG

LAB NOTES: QC w/ 18598

HOLDING TIMES: Prep date 5/24 - Samp date 5/22 = 2 days

NUMBER OF SAMPLES: Soil - Water 4 includes 1ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: -

Field: Pb 1.1B

FIELD DUPLICATES: -001 + -002 - very good correlation

SURROGATES: NA

MS/MSD: w/ 18598 - OK

INTERNAL STANDARDS: NA TUNING: NA

OTHER: LCS - OK control charts - OK

SUMMARY:

C of C requested Pb (total) only analyte

Same data also included w/ 18589 + 18598

DATA VALIDATION

CASE: 18605 **SITE:** 2, Background **ANALYSIS:** EDB

LAB NOTES: Packed columns were used instead of capillary columns. Pentane was used as extracting solvent. Sample 95184 had two disagreed values, an interferent coeluted w/ EDB in this samp

HOLDING TIMES: Analysis date 6/11 - Samp date 5/20 = 22 days

NUMBER OF SAMPLES: Soil — Water 15

CALIBRATION

Initial: % RSD for 6/11 out

Continuing: OK

~~**COEFFICIENT:**~~

BLANKS

Method: Not detected

Field: Not detected

FIELD DUPLICATES: 95182 + 95183 - no hits on either of these sample

SURROGATES: NA

MS/MSD: OK

BLANK SPIKE CONTROL CHART - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: - Method 504 MDL = 0.01 $\mu g/L$, Lab used 0.02 $\mu g/L$.

- Lab I.D. 95139 corresponds to -001 2BK-1W-1

SUMMARY:

Lab I.D.		Sample	
95139	-001	2BK-1W-1	for 18589
95140	-002	2M-5W-1	for 18589
95141	-003	ERS-20	for 18589
95142	-004	FBS-20A	for 18589
95143	-005	FBS-20B	for 18589
95164	-001	2MW-4W-1	for 1859[illegible]
95165	-002	2MW-3W-1	for 1859[illegible]
95166	-003	2MW-1W-1	for 1859[illegible]
95167	004	ERS-21	for 1859[illegible]
95168	005	TRIP	for 1859[illegible]
95182	001	2MW-6W-1	for 186
95183	002	2MW-6W-1 DUP	for 186
95184	003	2MW-2W-1	for 186
95185	004	ERS-22	for 186
95186	005	TRIP	for 186

DATA VALIDATION

CASE: 18771 **SITE:** 2 **ANALYSIS:** VOA

LAB NOTES: TICs not requested.

002 was reanalyzed since original analysis showed target compounds above calibration range. Possible MeCl contaminated in stored refrigerator.

HOLDING TIMES: Date analyzed 6/27 - Samp date 6/17 = 10 days

NUMBER OF SAMPLES: Soil - **Water** 5 includes 1ER
1FB
1 TRIP

CALIBRATION
Initial: OK

Continuing: 1,1,1-Trichloroethane + Carbon Tetrachloride out for 6/27, however, not found in samples - no action taken

COEFFICIENT: NA

BLANKS
Method: MeCl 1BJ, Acetone 8BJ, 2-Hexanone 2BJ, 4-Meth-2-Pentanon 2

Field: MeCl 39, Acetone 8BJ, CS_2 3J

FIELD DUPLICATES: None

SURROGATES: OK

MS/MSD: w/ 18785 - OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - ok

SUMMARY:

DATA VALIDATION

CASE: 18771 **SITE:** 2 **ANALYSIS:** SVOC

LAB NOTES: TICs not requested.

HOLDING TIMES: Extract date 6/19 - Samp date 6/17 = 2 days

NUMBER OF SAMPLES: **Soil** – **Water** 4 includes 1 FB
1 ER

CALIBRATION
Initial: OK

Continuing: 2-Methylnaphthalene out for 6/25, however, not found in samples - No action

COEFFICIENT: NA

BLANKS
Method: No hits

Field: No hits

FIELD DUPLICATES: None

SURROGATES: One surrogate out for 001 + 003 but >10%. - No action

MS/MSD: W/ 18785 - OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

DATA VALIDATION

CASE: 18771 **SITE:** 2 **ANALYSIS:** EDB

LAB NOTES: Packed columns were used instead of capillary column
Pentane was used as extracting solvent

HOLDING TIMES: Analysis date 6/26 - Samp date 6/17 = 9 days

NUMBER OF SAMPLES: **Soil** — **Water** 5 includes 1 FB
1 ER
1 TRIP

CALIBRATION

Initial: % RSD < 10% for 6/26 -OK
% RSD for 7/2 (16.7%) - out

Continuing: OK

~~**COEFFICIENT:**~~

BLANKS

Method: Not detected

Field: Not detected

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: Method 504 MDL = 0.01 μg/L, Lab used 0.02 μg/L
Blank spike control chart - OK

SUMMARY: Lab ID 96230 corresponds to -001 2MW-1
96231 -002 2MW-2
96232 -003 FB6-17
96233 -004 ER6-17
96234 -005 TRIP

DATA VALIDATION

CASE: 18771 **SITE:** 2 **ANALYSIS:** INORG

LAB NOTES: QC w/ 18785

HOLDING TIMES: Hg prep date 7/8 - Samp date 6/17 = 21 da

NUMBER OF SAMPLES: Soil - Water 4 includes 1 ER 1 FB

CALIBRATION
Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS
Method: Cr 3.1 B, Pb 1.3 B, Se 1.3 B
Field: Ba 3.1 B, Pb 1.3 B, Se 0.91 B, Cd 4.2 B

FIELD DUPLICATES: None

SURROGATES: NA

MS/MSD: w/ 18785 : Prespike for As + Pb out, postspike OK - no acti

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - OK
LCS - OK control charts - OK

SUMMARY: The 2 Site 2 samples were analyzed for Pb (total + soluble) only - as requested on chain-of custody
The 2 field blanks were for metals (total)

DATA VALIDATION

CASE: 18785 **SITE:** 2, Backgrand **ANALYSIS:** VOA

LAB NOTES: TICs not requested

Reanalyzed 002 since target compounds above calibration range.

Possible Methylene chloride contaminated in refrigerator that stored sample

HOLDING TIMES: Sampling Date 6/18 - Analysis Date 6/28 = 10 days

NUMBER OF SAMPLES: **Soil** — **Water** 8 includes 1 ER 1 TRIP

CALIBRATION

Initial: OK

Continuing: Carbon Tetrachloride - out for 6/28.

However, not found in samples. No action taken.

COEFFICIENT: NA

BLANKS Chloromethane 1BJ, Bromomethane 1BJ, Vinyl Cl 1BJ, MeCl 1BJ, Acetone 7

Method: Acetone 8BJ, 2-Hexanone 3BJ, 4-Meth-2pent 2BJ Vinyl acet

4-Meth-2Pe 2 E

Field: MeCl 27, Acetone 12B, CS_2 12

FIELD DUPLICATES: 006 + 007 - fairly good correlation

SURROGATES: OK

MS/MSD: OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

The rerun concentration of sample 002 (002DL) for methylene chloride which is 620 was used.

DATA VALIDATION

CASE: 18785 **SITE:** 2, Background **ANALYSIS:** SVOC

LAB NOTES: TICs not requested

Samples 002 + 003 were re-extracted outside holding times.

002-surrogate out + reanalyzed, result still out. 003-surrogate out + reanalyzed

HOLDING TIMES: Samp Date 6/18 - Extract Date 6/19 = 1 day

NUMBER OF SAMPLES: **Soil** — **Water** 7 includes 1ER

CALIBRATION

Initial: OK

Continuing: 2-Methylnaphthalene - out for 6/27 - not found in samples - no action taken

COEFFICIENT: NA

BLANKS

Method: Di-n-Butylphthalate 2BJ, bis(2-Ethylhexyl)phthalate 3B

Field: No hits

FIELD DUPLICATES: 006 + 007 - good correlation

SURROGATES: (see "SUMMARY" section)

MS/MSD: OK

INTERNAL STANDARDS: OK **TUNING:** OK

OTHER: Surrogate recovery charts - OK

SUMMARY:

Surrogate recovery results for re-extracted 002 + 003 were OK. However, reextraction date passed holding times - flag all positive results "J"

DATA VALIDATION

CASE: 18785 **SITE:** 2, Background **ANALYSIS:** EDB

LAB NOTES: Packed columns were used instead of capillary columns. Pentane was used as extracting solvent.

HOLDING TIMES: Analysis date 6/27 - Samp date 6/18 = 9 days

NUMBER OF SAMPLES: Soil — Water 8 includes 1 ER 1 TRIP

CALIBRATION

Initial: % RSD < 10% for 6/27 - OK
% RSD for 7/2 (16.7% RSD) - out

Continuing: OK

~~**COEFFICIENT:**~~

BLANKS

Method: not detected

Field: not detected

FIELD DUPLICATES: -006 and -007 - no hits

SURROGATES: NA

MS/MSD: OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: Method 504 MDL = 0.01 ug/L, Lab used 0.02 ug/L. Blank spike control chart - OK

SUMMARY: Lab ID 96288 corresponds to -001 2MW-3W-2

96288	-001	2MW-3W-2
96289	-002	2MW-4W-2
96290	-003	2MW-5W-2
96291	-004	2MW-6W-2
96292	-005	ER6-18
96293	-006	2BK-1W-2
96294	-007	2BK-1W-2 DUP
96295	-008	TRIP

DATA VALIDATION

CASE: 18785 **SITE:** 2, Background **ANALYSIS:** INORG

LAB NOTES: No problems

HOLDING TIMES: Hg Prep date 7/8 - Samp date 6/18 = 20 days

NUMBER OF SAMPLES: **Soil** – **Water** 7 includes 1 ER

CALIBRATION

Initial: OK

Continuing: OK

COEFFICIENT: Not found

BLANKS

Method: As 0.7 B, Cd 2.9 B, Pb 1.3 B, Se 1.3 B

Field: Ba 1.9 B, Pb 5.6,

FIELD DUPLICATES: 006 + 007 - fairly good correlation.

SURROGATES: NA

MS/MSD: Prespike for As + Pb - out, postspike - OK

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: ICS - OK

LCS - OK control charts - OK

SUMMARY: Lab Dup for Pb out - Flag results > 5 x CRDL "J".

-001 thru -004 were analyzed for Pb (total + soluble)

only as requested on chain-of-custody.

-005 (ER 6-18) was for metals (total)

DATA VALIDATION

CASE: 18794 SITE: 1, 3, Background ANALYSIS: VOA

LAB NOTES: TICs not requested
Possible contamination w/ MeCl from lab refrigerator
the 2 background samples (005 + 007) had to be diluted + re-analyzed due to high concentrations

HOLDING TIMES: 6/28 - 6/19 = 8 days
7/02 - 6/19 = 11 days - ~~ok if preserved~~

NUMBER OF SAMPLES: Soil — Water 9 includes 1 ER + 1 TRIP

CALIBRATION
Initial: ok

Continuing: CCl_4 28.4 CS_2 for 7/2 = 29.4 = J if any positives for 005DL -006 007DL ER6 + TRIP

COEFFICIENT: NA

BLANKS
Method: negligible
Field: ER - MeCl 30 B Acetone trip BJ

FIELD DUPLICATES: 001 + 002 fairly good correlation

SURROGATES: ok LCS - ok

MS/MSD: w/ 18785 - ok

INTERNAL STANDARDS: ok TUNING: ok

OTHER:

SUMMARY:

DATA VALIDATION

CASE: 18794 SITE: 1,3 and Background ANALYSIS: SVOC

LAB NOTES: TICs not requested

HOLDING TIMES: Ext 6/24 - Samp 6/19 = 5 days

NUMBER OF SAMPLES: Soil — Water 8 includes 1 ER

CALIBRATION

Initial: ok

Continuing: no hits in samples have corresponding %D or RRF50 out of control limits

COEFFICIENT: NA

BLANKS

Method: di-n-butyl p - 4BJ

Field: no hits

FIELD DUPLICATES: 001 + 002 - very good correlation

SURROGATES: ok

MS/MSD: w/ 18785 - ok

INTERNAL STANDARDS: ok TUNING: ok

OTHER:

SUMMARY:

DATA VALIDATION

CASE: 18794 SITE: 1, 3, Background ANALYSIS: INORG

LAB NOTES: No problems

HOLDING TIMES: Hg prep date 7/9 - 6/19 sampling: 20 days

NUMBER OF SAMPLES: Soil — Water 8 includes 1 ER

TOTAL + SOLUBLE

CALIBRATION

Initial: ok

Continuing: ok

correlation

COEFFICIENT: not found

BLANKS

Method: Pb in prep blank 1.3 B (x5 = 4.5) As = 0.7 B Se = 1.4 B

Field: no hits in ER except Ba 4.5 B Pb 2 B Se 1.4B

FIELD DUPLICATES: -001 + -002 good correlation

Lab dups - ok

SURROGATES: NA

MS/MSD: Pre-Spike Sol = ok; Total for Pb is 127.6 but post-spike is ok

Post-spike for Se is low (83.8) but samp conc < CRDL, so no action

INTERNAL STANDARDS: TUNING: N/A

OTHER: ICS = ok LCS - ok

Lead CRDL = 3

SUMMARY: ran continuing calibration CCV + CCB 6x each prior to lead analysis

→ Sample -006 was analyzed for Lead (Total + Sol) only (as requested in C-of-C)

DATA VALIDATION

CASE: 18794 **SITE:** #3 Background **ANALYSIS:** EDB

LAB NOTES: Pentane was used as extracting solvent

HOLDING TIMES: Analysis 6/27 – Samp 6/19 = 8 days

NUMBER OF SAMPLES: **Soil** — **Water** 5 includes 1 ER 1 TRIP

CALIBRATION
Initial: %RSD < 10% - ok for 6/27
(out for 7/2)

Continuing: ok

COEFFICIENT: Blank spike control chart - ok

BLANKS
Method: not detected

Field: not detected

FIELD DUPLICATES: none

SURROGATES: NA

MS/MSD: ok

INTERNAL STANDARDS: NA **TUNING:** NA

OTHER: Method 504 says IDL = 0.01; Lab says 0.02

SUMMARY: Lab ID 96352 corresponds to -005 BK
96353 -006 3MW-1W-2
96354 -007 BK
96355 -008 ER6
96356 -009 Trip

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Appendix F
GPS Memorandum

GROUND WATER AND SOIL GAS SURVEY

MISSISSIPPI AIR NATIONAL GUARD

GULFPORT FIELD TRAINING SITE

GULFPORT, MISSISSIPPI

TARGET ENVIRONMENTAL SERVICES, INC.

GROUND WATER AND SOIL GAS SURVEY

MISSISSIPPI AIR NATIONAL GUARD

GULFPORT FIELD TRAINING SITE

GULFPORT, MISSISSIPPI

PREPARED FOR

CH2M HILL

MONTGOMERY OFFICE

2567 FAIRLANE DRIVE

MONTGOMERY, ALABAMA 36116

PREPARED BY

TARGET ENVIRONMENTAL SERVICES, INC.

9180 RUMSEY ROAD

COLUMBIA, MARYLAND 21045

(301) 992-6622

APRIL 1991

EXECUTIVE SUMMARY

On April 16-19, 1991, **TARGET** Environmental Services, Inc. (**TARGET**) conducted a ground water and soil gas survey at the Mississippi Air National Guard, Gulfport Field Training Site, Gulfport-Biloxi Regional Airport, Gulfport, Mississippi to aid in the placement of soil borings and monitoring wells. All samples were analyzed by GC/FID for petroleum hydrocarbons.

High levels of Total Volatiles in **ground water** were observed within and northeast of the earth dike surrounding the storage tank, in the central survey area and south of the western former tank area. Total Volatiles in **soil gas** were also highest northeast of the earth dike. Lower level anomalies were present near the eastern former tank area and south of the western former tank area.

The chromatogram signatures of the **soil gas** samples with the highest levels of Total Volatiles as well as the **ground water** samples from the northeastern portion of the site reveal characteristics of a complex petroleum hydrocarbon fuel mixture. Considering the site history, the signature may represent jet fuel. A different fuel mixture, possibly aviation gas, is depicted in the **ground water** samples from the central survey area and south of the western former tank area.

Map patterns and chromatographic data from both the soil gas and ground water surveys reveal three significant areas of contamination: inside and east of the earth dike surrounding the above ground storage tank, south of the western former tank area and in the central survey area. A complex petroleum hydrocarbon fuel mixture such as jet fuel and/or aviation gas is present in the subsurface of these areas.

Introduction

Jet fuel and aviation gas (AVGAS) were previously stored and distributed at the Mississippi Air National Guard, Gulfport Field Training Site, Gulfport-Biloxi Regional Airport, Gulfport, Mississippi. The AVGAS tanks were removed in 1973 and 1974. The above-ground jet fuel tank is now empty. **CH2M Hill** contracted **TARGET** Environmental Services, Inc. (**TARGET**) to perform a ground water and soil gas survey at the site to aid in the placement of borings and monitoring wells. The purpose of the surveys was to screen the site for potential sources of BTEX contamination. Ground water is reported at a depth of 2.5 to 5 feet with variable flow controlled by the presence of nearby streams. The field phase of the project was conducted on April 16-19, 1991.

Detectability

The soil gas survey data presented in this report are the result of precise sampling and measurement of contaminant concentrations in the vadose zone. Analyte detection at a particular location is representative of vapor, dissolved, and/or liquid phase contamination at that location. The presence of detectable levels of target analytes in the vadose zone is dependent upon several factors, including the presence of vapor-phase hydrocarbons or dissolved or liquid concentrations adequate to facilitate volatilization into the unsaturated zone.

Terminology

In order to prevent misunderstanding of certain terms used in this report, the following clarifications are offered:

The term "feature" is used in reference to a discernible pattern in the contoured data. It denotes a contour form rather than a definite or separate chemical occurrence.

The term "occurrence" is used to indicate an area where chemical compounds are present in sufficient concentrations to be detected by the analysis of soil vapors. The term is not indicative of any specific mode of occurrence (vapor, dissolved, etc.), and does not necessarily indicate or suggest the presence of "free product" or "phase-separated hydrocarbons."

The term "anomaly" refers to an area where hydrocarbons were measured in excess of what would normally be considered "natural" or "background" levels.

The term "analyte" refers to any of the hydrocarbons standardized for quantification in the chromatographic analysis.

The term "vadose zone" represents the unsaturated zone between the ground water table and the ground surface.

The term "indicates" is used when evidence dictates a unique conclusion. The term "suggests" is used when several explanations of certain evidence are possible, but one in particular seems more likely. As a result, "indicates" carries a higher degree of confidence in a conclusion than does "suggests."

Field Procedures

Ground water samples were collected at a total of 38 locations at the site, as shown in Figure 1A. To collect the samples, connected 3' sections of steel casing were manually advanced to a depth of 6'. The casing was advanced to a depth of 3' for Samples 31-W, 38-W and 44-W. Once the steel casing was in place, water was allowed to fill the casing. Several hours were required for the soil to release enough water to collect a sample. Several samples were attempted but were uncollectable because sufficient water did not enter the casing. A water level sensor was used to detect the surface of the ground water table and to ensure that a sufficient amount of water was present to complete a sample. The water level sensor was removed and a stainless steel bailer was used to collect 40 ml of ground water. Samples were placed in glass vials, sealed, labeled and taken to **TARGET's** on-site mobile laboratory for analysis.

Prior to the day's field activities and after collection of each sample, the steel casing, water level sensor and bailer apparatus were decontaminated by washing with Contrad, rinsing with distilled water and drying with nitrogen gas to ensure discrete sampling.

Four (4) **surface water** samples (Samples 32-W, 33-W, 34-W and 52-W) were collected from the bayou and three surface puddles at the site, as shown in Figure 1A. To collect the samples, the 40 ml vial was submerged beneath the surface water. Once collected, the samples were sealed, labeled and taken to the mobile laboratory for analysis.

Equipment rinsate blanks were collected at the beginning and end of each day's field activities. These QA/QC samples were obtained using distilled water. The volatile hydrocarbons observed in Equipment Rinsate Blanks 1-W and 20-W are the result of incomplete decontamination of the sampling equipment prior to the day's field operations, while the volatile hydrocarbons reported in Equipment Rinsate Blanks 51-W and 75-W are most likely the result of carryover in the sampling equipment.

Soil gas samples were collected at a total of 43 locations at the site, as shown in Figure 1B. It was not possible to collect soil vapor samples at all the sample points because of water-saturated soils. Although the proposed sampling depth was 4 feet, the saturated soils necessitated that the majority of the samples be collected at a 2 foot depth. Only Samples 16-19 were collected at 4 feet, while Samples 13-15 were collected at a depth of 1 foot. To collect the samples a 1/2 inch hole was produced by using a drive rod. The entire sampling system was purged with ambient air drawn through an organic vapor filter cartridge, and a stainless steel probe was inserted to the full depth of the hole and sealed off from the atmosphere. A sample of in-situ soil gas was then withdrawn through the probe and used to purge atmospheric air from the sampling system. A second sample of soil gas was withdrawn through the probe and encapsulated in a pre-evacuated glass vial at two atmospheres of pressure (15 psig). The self-sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis.

Prior to the day's field activities all sampling equipment, slide hammer rods, and probes were decontaminated by washing with Contrad and rinsing thoroughly. Internal surfaces were flushed dry using pre-purified nitrogen or filtered ambient air, and external surfaces were wiped clean using clean paper towels.

Field control samples were collected at the beginning and end of each day's field activities and after the twenty-fourth soil gas sample on the second day. These QA/QC samples were obtained by filtering ambient air through a dust and organic vapor filter cartridge and collecting in the same manner as described above. The volatile hydrocarbons reported in Field Control Samples 3, 5 and 6 are the result of carryover in the sampling equipment following the collection of Samples 22, 49 and 75, respectively, while those in Field Control Sample 4 are the result of incomplete decontamination of the sampling equipment prior to beginning field activities on April 17.

Laboratory Procedures

All of the **soil gas** samples collected during the field phase of the survey were analyzed on-site in **TARGET**'s climate-controlled mobile laboratory according to EPA Method 602 (modified) on a gas chromatograph equipped with a flame ionization detector (GC/FID), but using direct injection instead of purge and trap. The head space of the **ground water** samples was obtained following removal of 10 ml of water from the vial and heating the remaining sample for 5 minutes at 80°C. Analytes selected for standardization were:

benzene
toluene
ethylbenzene
meta- and para-xylene
ortho-xylene

These compounds were chosen because of their utility in evaluating the presence of petroleum products such as fuels, lubricating oils, and non-halogenated solvents.

The analytical equipment was calibrated using an instrument response curve and injection of known concentrations of the above standards. Retention times of the standards were used to identify the peaks in the chromatograms of the field samples, and their response factors were used to calculate the analyte concentrations.

FID Total Volatiles values were generated by summing the areas of all integrated chromatogram peaks and calculated using the instrument response factor for toluene. Injection peaks, which also contain the light hydrocarbon methane, were excluded to avoid the skewing of Total Volatiles values due to injection disturbances and biogenic methane. For samples with low hydrocarbon concentrations, the calculated Total Volatiles concentration is occasionally lower

than the sum of the individual analytes. This is because the response factor used for the Total Volatiles calculation is a constant, whereas the individual analyte response factors vary with concentration. It is important to understand that the Total Volatiles levels reported are relative, not absolute, values.

The tabulated results of the laboratory analysis of the **ground water** samples are reported in parts per billion (ppb) in Table 1, while the **soil gas** results are reported in micrograms per liter (μg/l) in Table 2. Although "micrograms per liter" is equivalent to "parts per billion (v/v)" in water analyses, they are not equivalent in gas analyses, due to the difference in the mass of equal volumes of water and gas matrices.

For QA/QC purposes, a duplicate analysis was performed on every tenth field sample. Laboratory blanks of nitrogen gas (99.999%) were also analyzed after every tenth field sample. The volatile hydrocarbons reported in **soil gas** Laboratory Blanks BSCGP-2 and BSCGP-4 are the result of carryover in the chromatographic column following the analysis of Samples 32 and 65, respectively. The volatile hydrocarbons reported in **ground water** headspace Laboratory Blanks BSCGP-1 and BSCGP-2 are most likely the result of contamination introduced during the creation of the headspace sample.

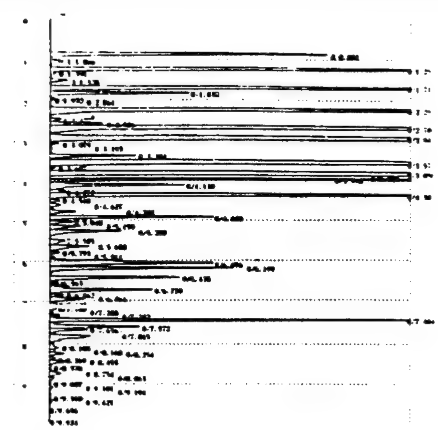
Discussion and Interpretation of Results

In order to provide graphic presentation of the results, individual data sets in Tables 1 and 2 have been mapped and contoured to produce Figures 2 through 13. Contours on Figure 2 are drawn with respect to analyte concentrations in the ground water, not the surface water. Dashed contours are used where patterns are extrapolated into areas of less complete data, or as auxiliary contours. Map sample points with no data shown indicate that the analyte concentrations in the sample were below the detection limit. Heavy intermittent rains during the field activities may have influenced the distribution and concentrations of volatile hydrocarbons observed.

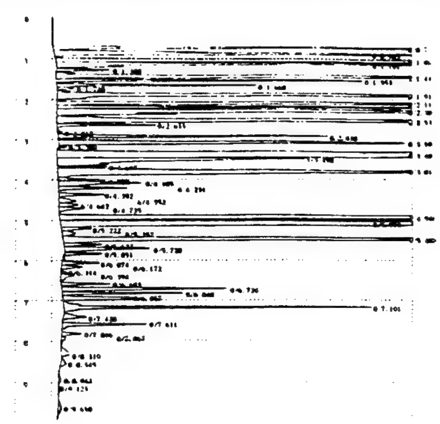
High levels of Total Volatiles in **ground water** were observed within and northeast of the earth dike surrounding the storage tank. This occurrence appears to extend eastward to the survey boundary (Stations 26-W and 44-W) and southwestward beyond the storage tank (Stations 56-W and 57-W). High levels are also present northwest of the earth dike in the central survey area (Stations 71-W and 72-W), as well as south of the western former tank area (Stations 27-W and 50-W). Relatively low levels were observed in most of the remaining samples.

Benzene (Figure 3) was highest south of the western former tank area (Station 50-W). More moderate levels extend from the central survey area southeastward across the earth dike to the survey boundary. Map patterns for toluene (Figure 4) generally resemble those of Total Volatiles. Comparable levels of ethylbenzene (Figure 5) are present in the central survey area (Stations

71-W and 72-W) and south of the western former tank area (Station 50-W). M- and p-xylene (Figure 6) is highest south of the western former tank area (Station 50-W). Somewhat lower occurrences are present in the central survey area and east of the above ground storage tank. O-xylene is highest inside the earth dike surrounding the above ground storage tank (Station 54-W). Lower levels are present in the central survey area and south of the western former tank area.



CHROMATOGRAM 1. GC/FID SIGNATURE OF SAMPLE 54-W

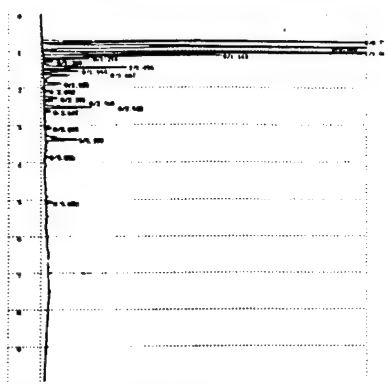


CHROMATOGRAM 2. GC/FID SIGNATURE OF SAMPLE 50-W

The chromatogram signatures of the **ground water** samples collected within and east of the earth dike surrounding the above ground storage tank reveal characteristics of a complex petroleum hydrocarbon fuel mixture, as exemplified by Chromatogram 1, Sample 54-W. Considering the site history, this signature may represent jet fuel. A different fuel mixture, possibly aviation gas, is depicted in samples from the central survey area and south of the eastern former tank area (Chromatogram 2, Sample 50-W).

Relatively low levels of Total Volatiles were observed in three of the four **surface water** samples (Samples 32-W, 33-W, and

34-W). Volatile hydrocarbons were not detected above the 10 ppb detection limit in Sample 52-W (west of the storage tank). Early-eluting peaks representative of the more volatile and mobile petroleum hydrocarbons dominate the chromatograms of the **surface water** samples (Chromatogram 3, Sample 34-W).



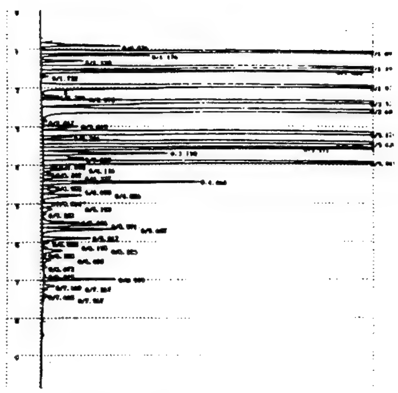
CHROMATOGRAM 3. GC/FID SIGNATURE OF SAMPLE 34-W

Total Volatiles in **soil gas** (Figure 8) were highest northeast of the earth dike (Station 62). Lower level anomalies were present near the eastern former tank area (Station 42) and south of the western former tank area (Station 32). Very low levels were present throughout the remainder of the sampling locations.

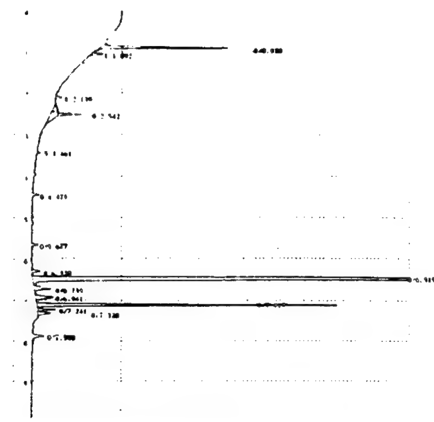
Very low levels of benzene (Figure 9) were present east of the earth dike (Station 62), on the northwestern survey boundary (Station 32) and east of the eastern former tank area (Station 42). Map patterns for toluene (Figure 10) resembled those of Total Volatiles, except that toluene was not observed near the western former tank area. The ethylbenzene occurrence (Figure 11) was similar to benzene. M- and p-xylene (Figure 12) and o-xylene (Figure 13) were highest east of the earth dike (Station 62) and east of the eastern former tank area (Station 42), with very low levels scattered throughout the remainder of the site.

The chromatogram signatures of the **soil gas** samples with the highest levels of Total Volatiles (Samples 32, 42 and 62) are

similar and reveal a complex petroleum hydrocarbon fuel mixture similar to that observed in the ground water headspace samples from the northeastern portion of the site (see Chromatogram 4, Sample 32). Samples east of the western former tank area exhibit isolated late peaks suggestive of terpenes (Chromatogram 5, Sample 16).



CHROMATOGRAM 4. GC/FID SIGNATURE OF SAMPLE 32



CHROMATOGRAM 5. GC/FID SIGNATURE OF SAMPLE 16

Terpenes are naturally occurring hydrocarbons exuded by plant roots and do not represent a contamination problem.

Based on sampling order and chromatographic evidence (the volatile hydrocarbons observed in the chromatograms of the field control samples resemble those in many of the samples with very low levels of Total Volatiles), it is suspected that the volatile hydrocarbons observed in samples with very low levels of volatiles are the result of persistent carryover in the sampling equipment and may not reflect conditions in the soil gas at these locations. A contamination problem is also evident in the ground water portion of the survey, wherein the low levels of volatiles in ground water samples may, in fact, be due to carryover in the sampling equipment rather than true contamination in the ground water.

Map patterns and chromatographic data from both the soil gas and ground water surveys reveal three significant areas of contamination: inside and east of the earth dike surrounding the above ground storage tank, south of the western former tank area and in the central survey area. A complex petroleum hydrocarbon fuel mixture such as jet fuel or aviation gas is present in the subsurface of these areas.

TABLE 1

LABORATORY RESULTS OF GROUND WATER VIA HEADSPACE ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN PARTS PER BILLION

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
13-W	<10	<10	12	<10	<10	266
21-W	352	1,010	5	31	147	9,061
22-W	133	1,612	25	96	921	12,620
24-W	<10	20	<10	<10	<10	812
25-W	418	446	<10	<10	<10	4,097
26-W	188	425	62	132	27	5,372
27-W	<10	6,396	562	2,071	9,051	62,310
28-W	<10	<10	<10	<10	<10	116
29-W	<10	<10	<10	<10	<10	497
30-W	<10	<10	<10	<10	<10	83
31-W	921	29,550	371	2,648	6,906	200,200
32-W	<10	<10	<10	<10	<10	375
33-W	<10	<10	<10	<10	<10	355
34-W	<10	<10	<10	<10	<10	507
35-W	<10	17	<10	<10	<10	326
36-W	<10	266	35	90	833	3,413
37-W	<10	27	<10	<10	<10	2,025
38-W	<10	38	<10	<10	<10	219
39-W	86	33	<10	<10	<10	1,742
40-W	<10	<10	<10	<10	<10	69
41-W	<10	35	<10	<10	<10	201
42-W	<10	18	<10	<10	<10	317
44-W	<10	121	<10	19	140	1,031
47-W	<10	12	<10	<10	<10	481
48-W	<10	13	<10	<10	<10	408
49-W	<10	11	<10	<10	<10	406
50-W	1,499	8,038	1,236	28,200	3,383	20,960
52-W	<10	<10	<10	<10	<10	<10
54-W	327	45,590	406	3,335	23,850	300,300
55-W	<10	94	<10	<10	<10	654

[1] CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

TABLE 1 (cont)

LABORATORY RESULTS OF GROUND WATER VIA HEADSPACE ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN PARTS PER BILLION

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
56-W	<10	<10	<10	<10	89	630
57-W	<10	20	<10	<10	<10	109
61-W	<10	13	<10	17	17	48
63-W	<10	12	<10	<10	17	37
64-W	<10	40	<10	<10	22	223
65-W	<10	22	<10	35	13	37
66-W	<10	1,164	18	100	593	8,078
70-W	<10	13	<10	<10	15	59
71-W	626	7,758	1,900	11,010	3,872	74,180
72-W	895	10,400	1,567	9,378	2,326	50,160
73-W	<10	75	16	86	27	234
74-W	<10	19	<10	40	15	41
EQUIPMENT RINSATE BLANKS						
1-W	<10	<10	<10	<10	<10	47
20-W	<10	19	<10	<10	<10	285
51-W	<10	<10	<10	<10	<10	76
75-W	<10	<10	<10	29	14	20
LABORATORY DUPLICATE ANALYSES						
20-W	<10	19	<10	<10	<10	285
20-WR	<10	<10	<10	<10	<10	138
48-W	<10	13	<10	<10	<10	408
48-WR	<10	18	<10	<10	<10	483
70-W	<10	13	<10	<10	15	59
70-WR	<10	14	<10	<10	16	66

[1]CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

TABLE 1 (cont)

LABORATORY RESULTS OF GROUND WATER VIA HEADSPACE ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN PARTS PER BILLION

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
LABORATORY BLANKS						
BSCGP-1	<10	<10	<10	<10	<10	79
BSCGP-2	<10	<10	<10	<10	<10	444
BSCGP-3	<10	<10	<10	<10	<10	<10

[1]CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

TABLE 2

LABORATORY RESULTS OF SOIL GAS ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN MICROGRAMS PER LITER

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
11	<1.0	1.3	<1.0	1.7	1.0	3.8
12	<1.0	1.4	<1.0	1.9	1.0	7.4
13	<1.0	<1.0	<1.0	<1.0	<1.0	23
14	<1.0	<1.0	<1.0	<1.0	<1.0	2.5
15	<1.0	<1.0	<1.0	1.2	<1.0	2.7
16	<1.0	<1.0	<1.0	<1.0	<1.0	157
17	<1.0	<1.0	<1.0	<1.0	<1.0	13
18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
19	<1.0	<1.0	<1.0	1.2	<1.0	2.1
20	<1.0	<1.0	<1.0	<1.0	<1.0	15
22	<1.0	<1.0	<1.0	1.3	<1.0	5.5
24	<1.0	<1.0	<1.0	<1.0	<1.0	2.6
25	<1.0	9.4	<1.0	<1.0	1.2	56
26	<1.0	<1.0	<1.0	<1.0	<1.0	3.0
27	<1.0	<1.0	<1.0	<1.0	<1.0	2.7
28	<1.0	<1.0	<1.0	<1.0	<1.0	3.7
29	<1.0	<1.0	<1.0	1.2	<1.0	2.7
30	<1.0	<1.0	<1.0	<1.0	<1.0	3.2
31	<1.0	<1.0	<1.0	<1.0	<1.0	2.2
32	2.0	1,044	11	7.7	27	10,230
33	<1.0	3.8	<1.0	<1.0	<1.0	28
34	<1.0	<1.0	<1.0	<1.0	<1.0	5.8
35	<1.0	<1.0	<1.0	<1.0	<1.0	3.9
42	13	5,783	20	35	171	55,690
43	<1.0	20	<1.0	1.4	3.1	93
45	<1.0	2.9	<1.0	1.4	1.3	16
46	<1.0	2.8	<1.0	1.4	1.4	19
47	<1.0	1.7	<1.0	1.4	1.2	11
49	<1.0	2.2	<1.0	1.5	1.5	16

[1]CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

TABLE 2 (cont)

LABORATORY RESULTS OF SOIL GAS ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN MICROGRAMS PER LITER

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
50	<1.0	<1.0	<1.0	<1.0	<1.0	7.6
51	<1.0	<1.0	<1.0	1.2	<1.0	5.7
52	<1.0	3.4	<1.0	1.2	1.1	21
53	<1.0	<1.0	<1.0	<1.0	<1.0	3.3
58	<1.0	1.4	<1.0	<1.0	<1.0	16
62	28	14,520	50	85	277	130,800
65	<1.0	46	<1.0	2.1	4.2	333
69	<1.0	14	<1.0	1.4	1.5	131
70	<1.0	4.8	<1.0	1.2	<1.0	58
71	<1.0	2.7	<1.0	1.1	<1.0	22
72	<1.0	2.5	<1.0	1.3	1.4	17
73	<1.0	98	1.9	4.6	11	561
74	<1.0	<1.0	<1.0	<1.0	<1.0	1.3
75	<1.0	<1.0	<1.0	<1.0	<1.0	1.2

[1]CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

TABLE 2 (cont)

LABORATORY RESULTS OF SOIL GAS ANALYSIS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN MICROGRAMS PER LITER

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	m- & p-XYLENE	o-XYLENE	TOTAL VOLATILES[1]
FIELD CONTROL SAMPLES						
2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3	<1.0	1.6	<1.0	<1.0	<1.0	8.3
4	<1.0	<1.0	<1.0	<1.0	<1.0	2.7
5	<1.0	<1.0	<1.0	<1.0	<1.0	2.0
6	<1.0	7.7	<1.0	1.7	2.7	46
LABORATORY DUPLICATE ANALYSES						
22	<1.0	<1.0	<1.0	1.3	<1.0	5.5
22R	<1.0	<1.0	<1.0	<1.0	<1.0	2.0
32	2.0	1,044	11	7.7	27	10,230
32R	5.6	1,024	11	7.7	44	10,190
43	<1.0	20	<1.0	1.4	3.1	93
43R	<1.0	15	<1.0	1.5	3.1	92
65	<1.0	46	<1.0	2.1	4.2	333
65R	<1.0	44	<1.0	2.0	4.0	320
LABORATORY BLANKS						
BSCGP-1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BSCGP-2	<1.0	<1.0	<1.0	<1.0	<1.0	4.4
BSCGP-3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BSCGP-4	<1.0	1.6	<1.0	<1.0	<1.0	8.8

[1]CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE

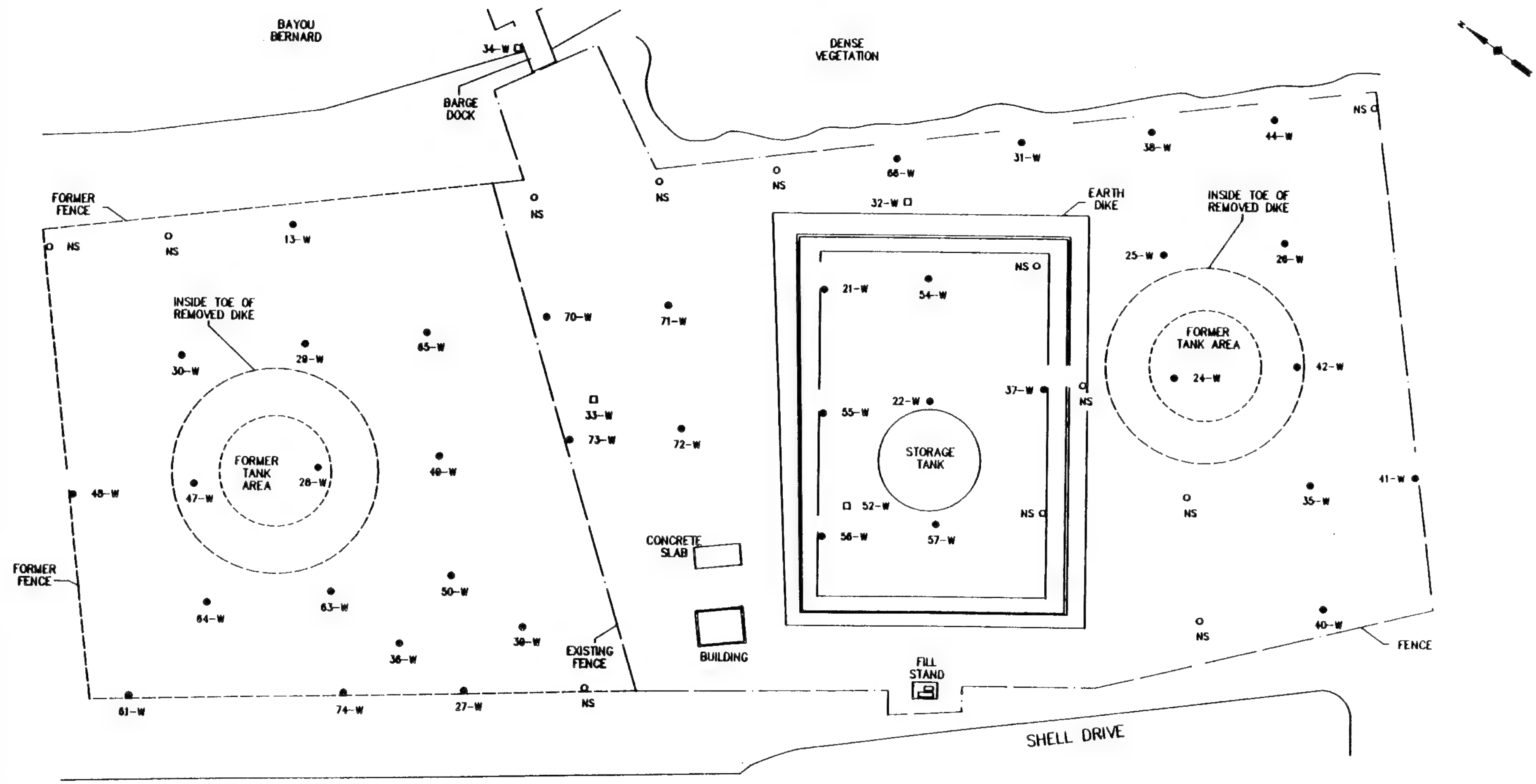


FIGURE 1A Water Sample Locations

0 25 50
FEET

- ● GROUND WATER SAMPLE LOCATIONS
- o NOT SAMPLED (UNCOLLECTABLE)
- □ SURFACE WATER SAMPLE LOCATIONS

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

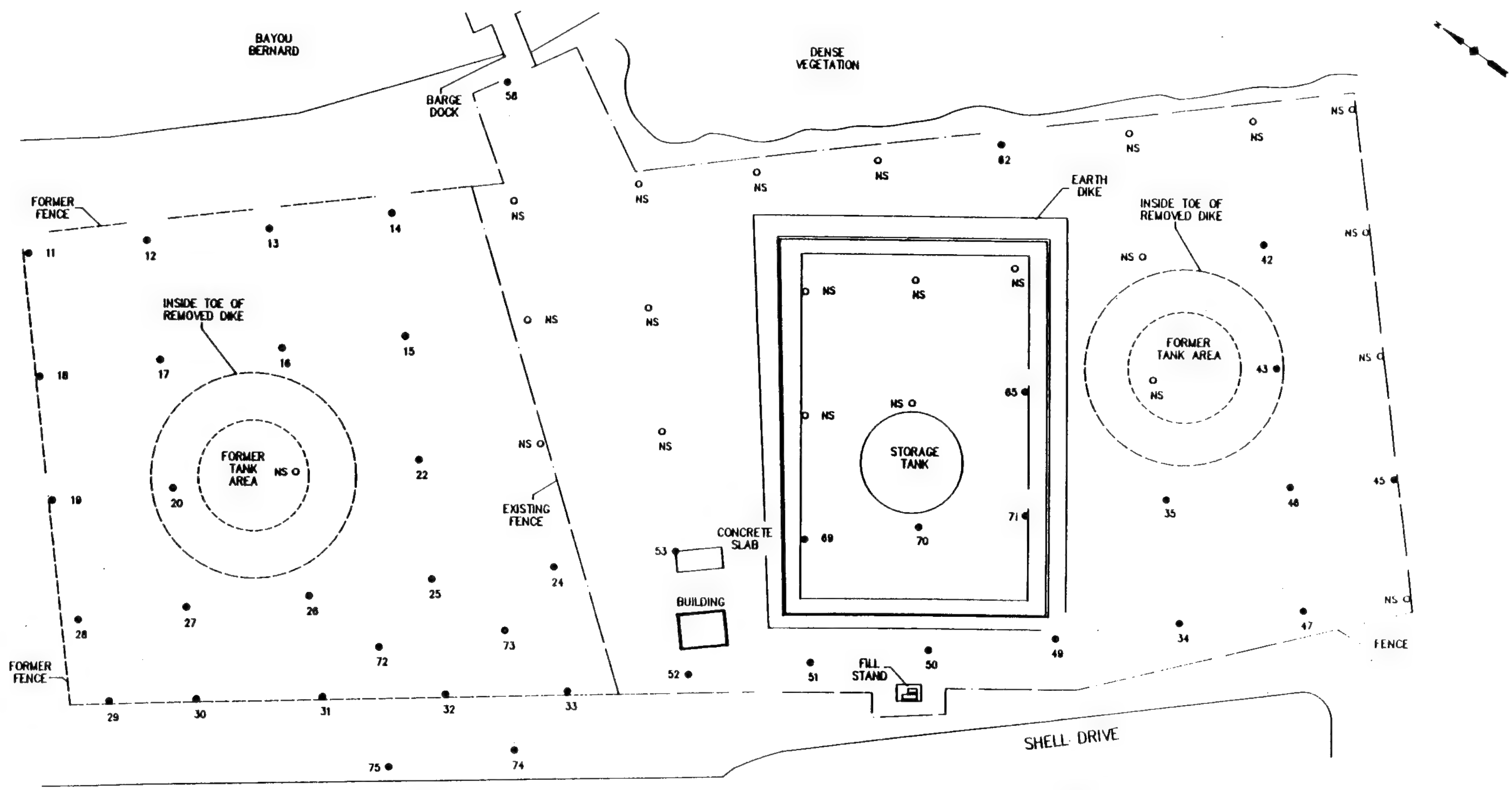


FIGURE 1B Soil Gas Sample Locations

0 25 50
FEET

● SOIL GAS SAMPLE LOCATION
○ NOT SAMPLED (UNCOLLECTABLE)

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

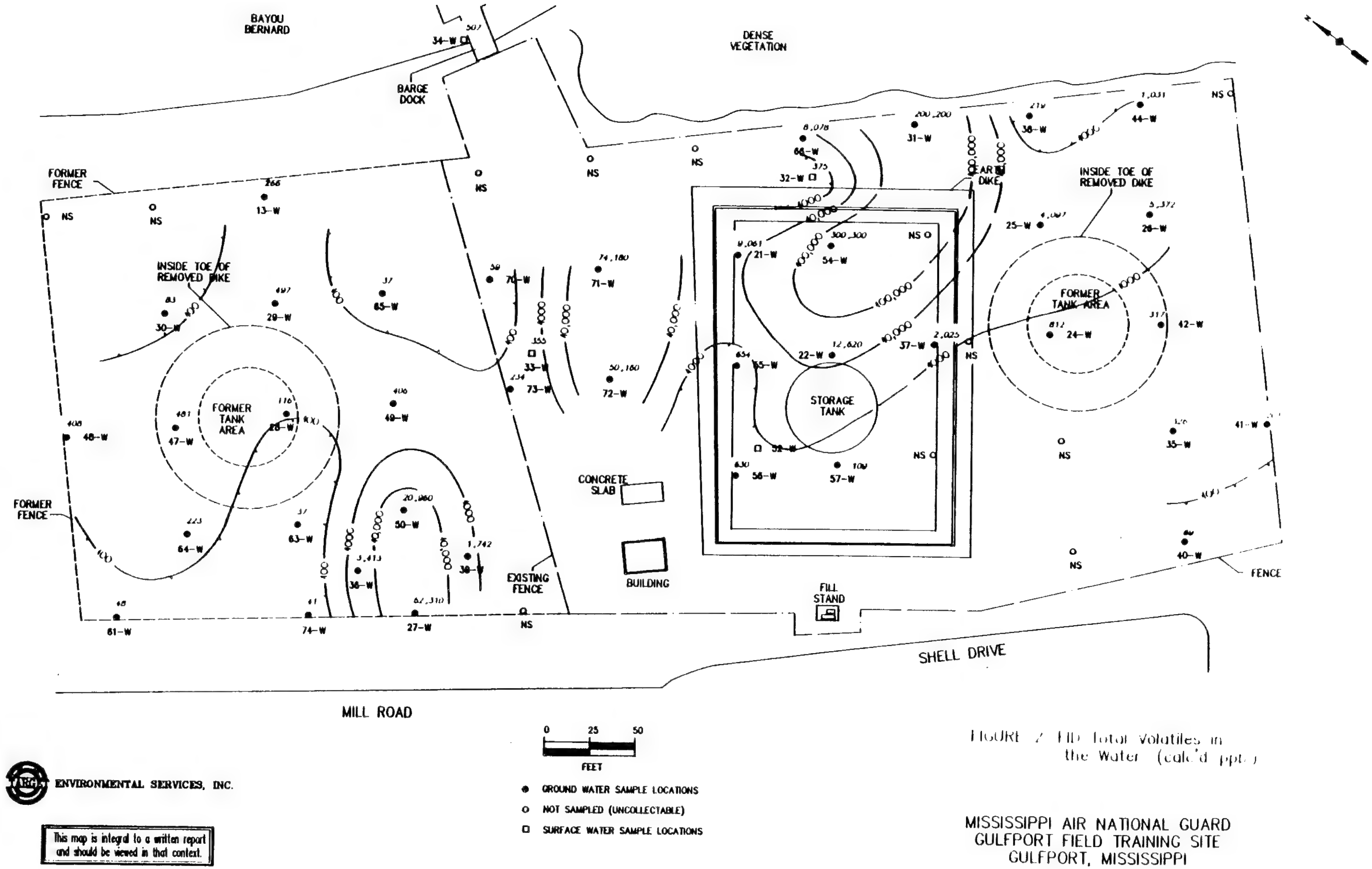


FIGURE 7 FID Total Volatiles in the Water (calc'd ppb)

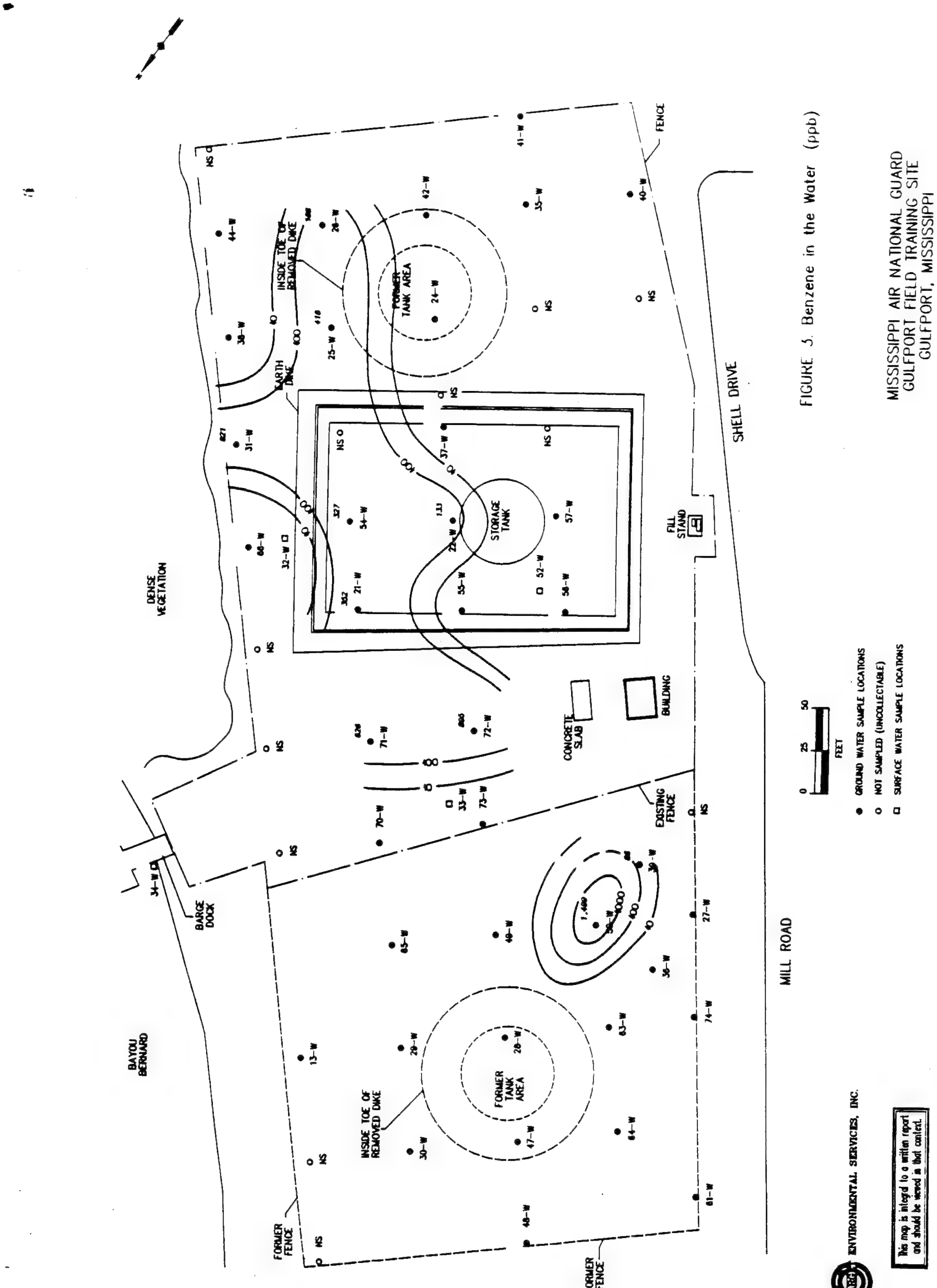


FIGURE 5. Benzene in the Water (ppb)

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GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

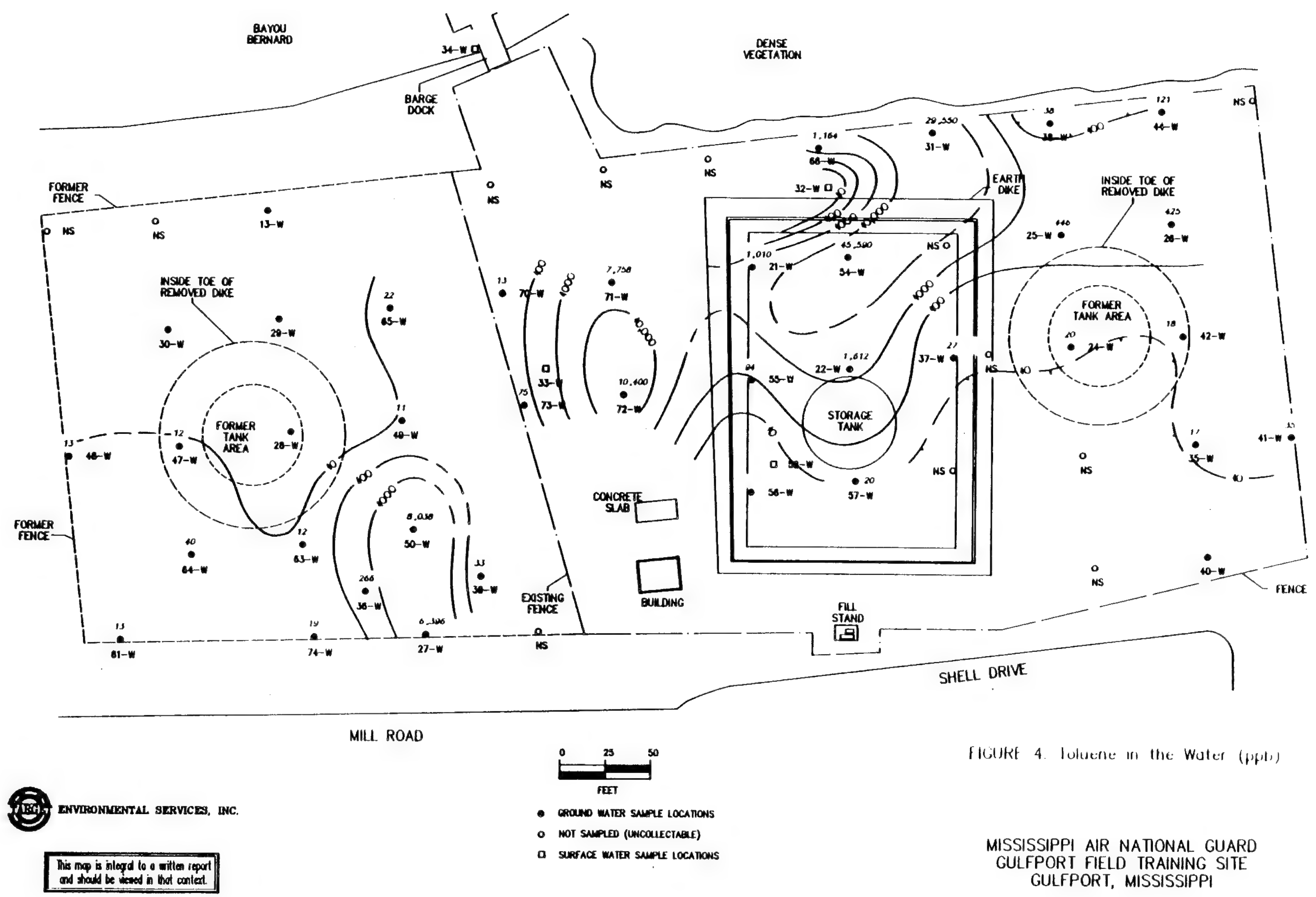

FIGURE 4. Toluene in the Water (ppb)

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GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

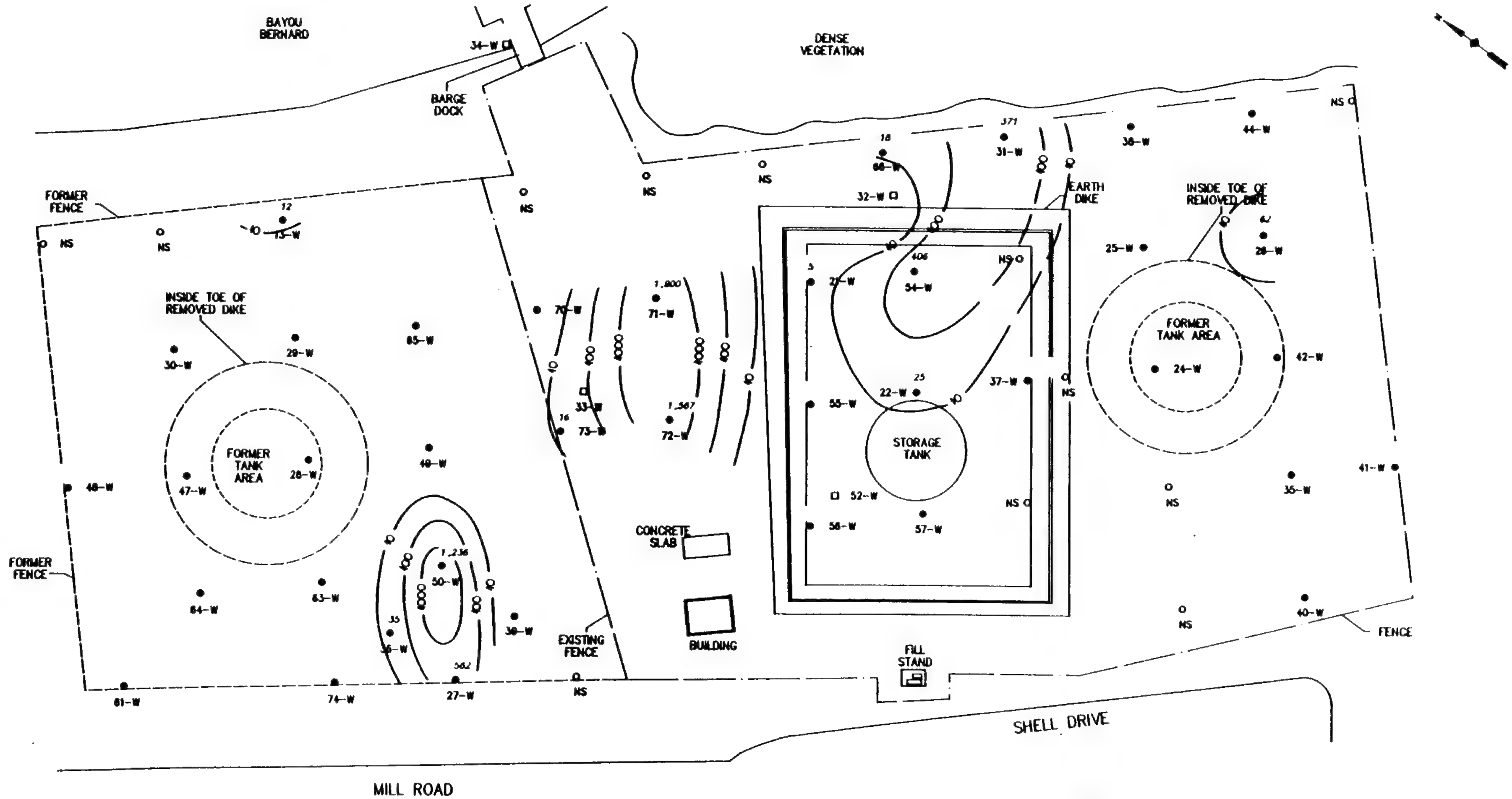


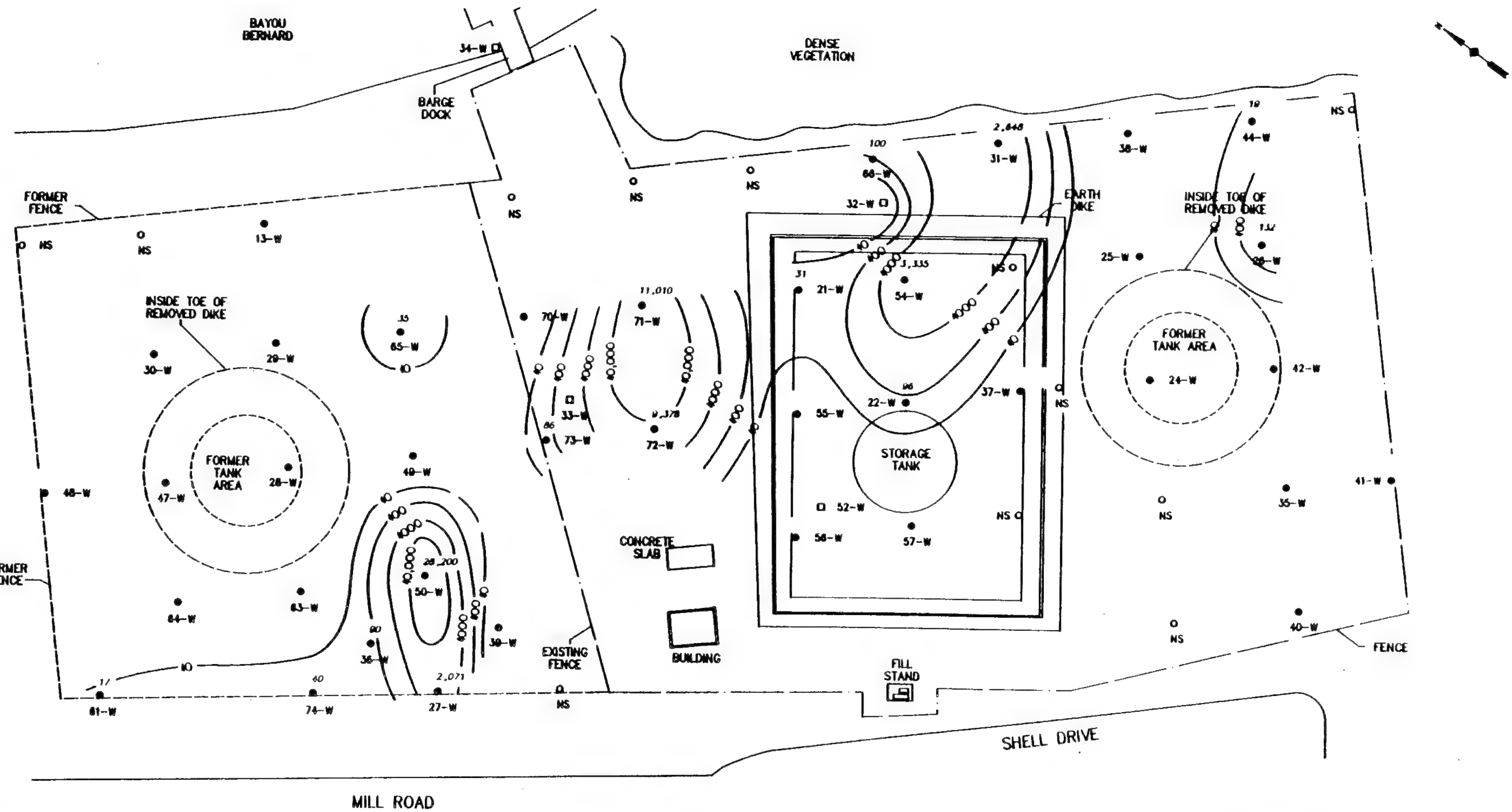
FIGURE 5 Ethylbenzene in the Water (ppb)

● GROUND WATER SAMPLE LOCATIONS
○ NOT SAMPLED (UNCOLLECTABLE)
□ SURFACE WATER SAMPLE LOCATIONS

ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI



0 25 50
FEET

- GROUND WATER SAMPLE LOCATIONS
- NOT SAMPLED (UNCOLLECTABLE)
- SURFACE WATER SAMPLE LOCATIONS

FIGURE 6 meta and para-Xylene in the Water (ppb)

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

ENVIRONMENTAL SERVICES, INC.

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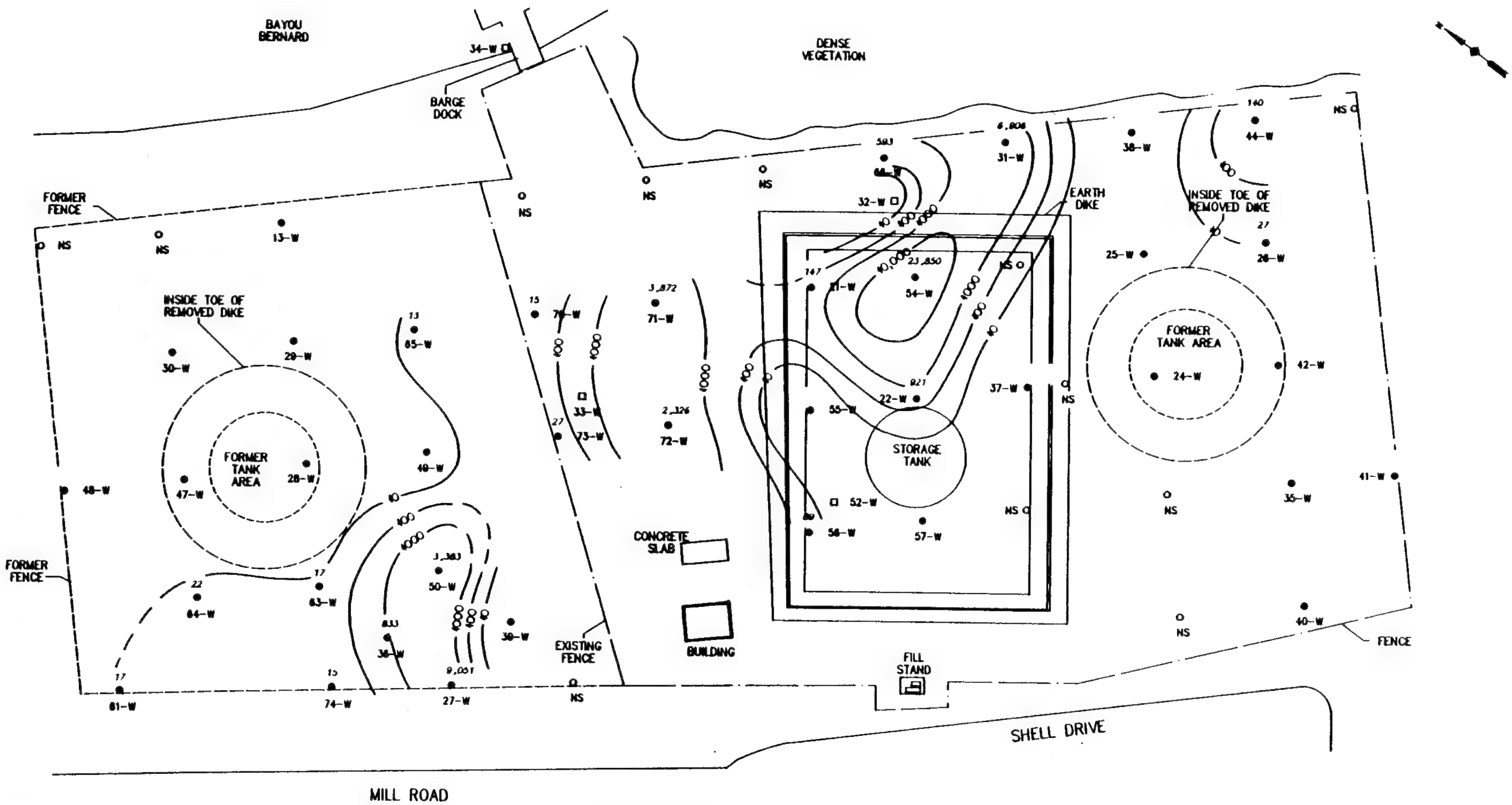

0 25 50
FEET

- ● GROUND WATER SAMPLE LOCATIONS
- o NOT SAMPLED (UNCOLLECTABLE)
- □ SURFACE WATER SAMPLE LOCATIONS

ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

FIGURE 7. ortho Xylene in the Water (ppb)

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GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

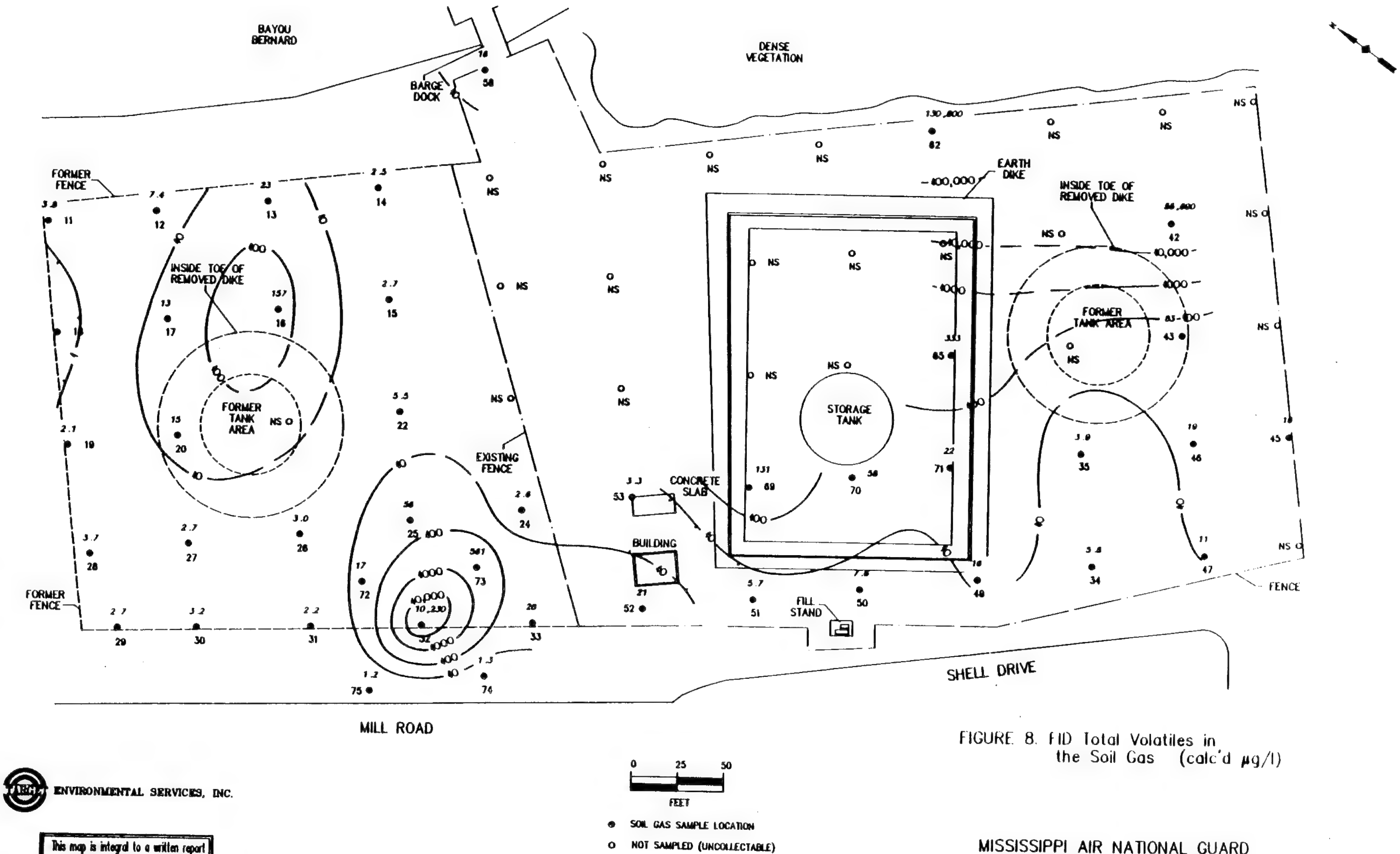

FIGURE 8. FID Total Volatiles in the Soil Gas (calc'd μg/l)

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

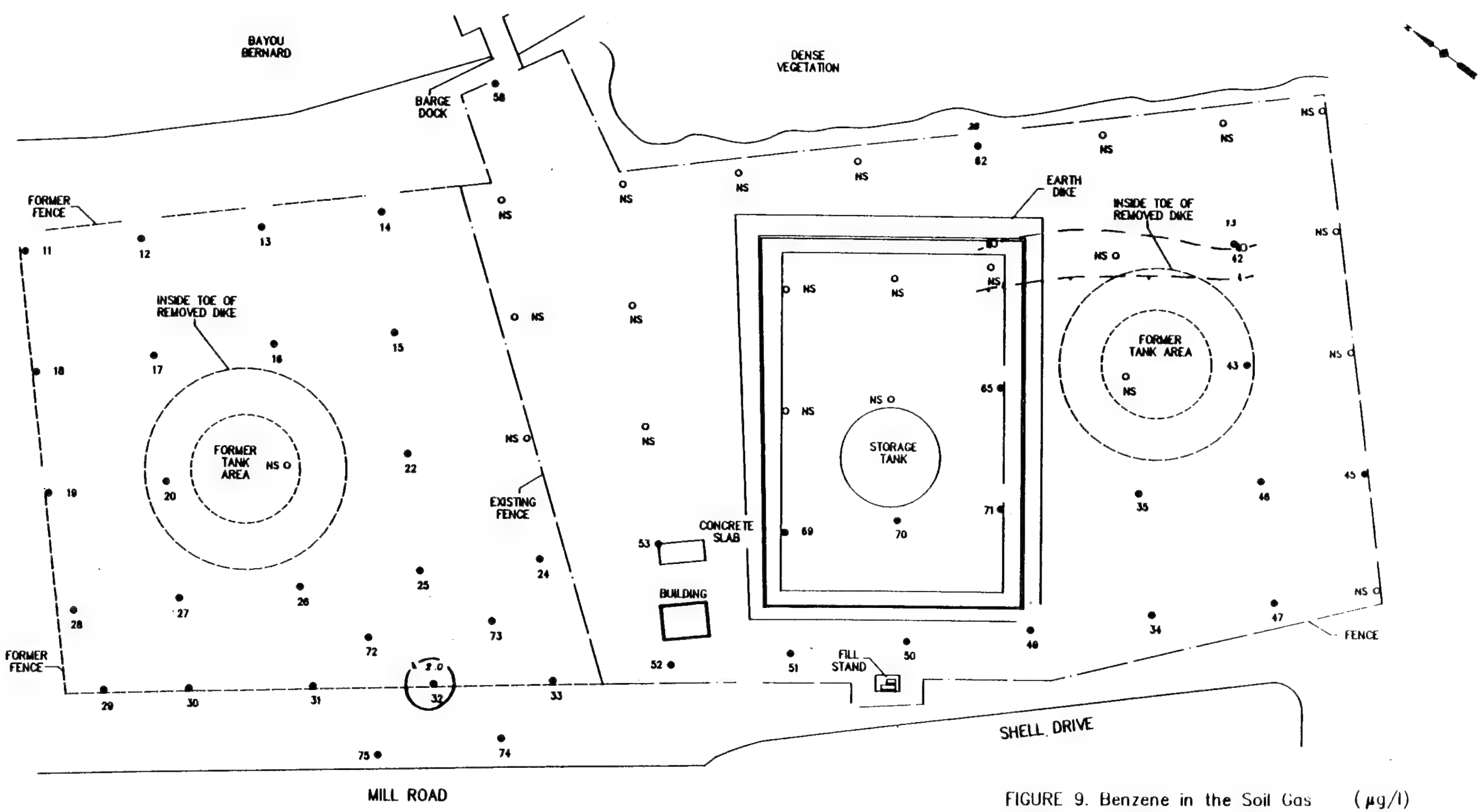

FIGURE 9. Benzene in the Soil Gas (µg/l)

0 25 50
FEET

● SOIL GAS SAMPLE LOCATION
○ NOT SAMPLED (UNCOLLECTABLE)

ENVIRONMENTAL SERVICES, INC.

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MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

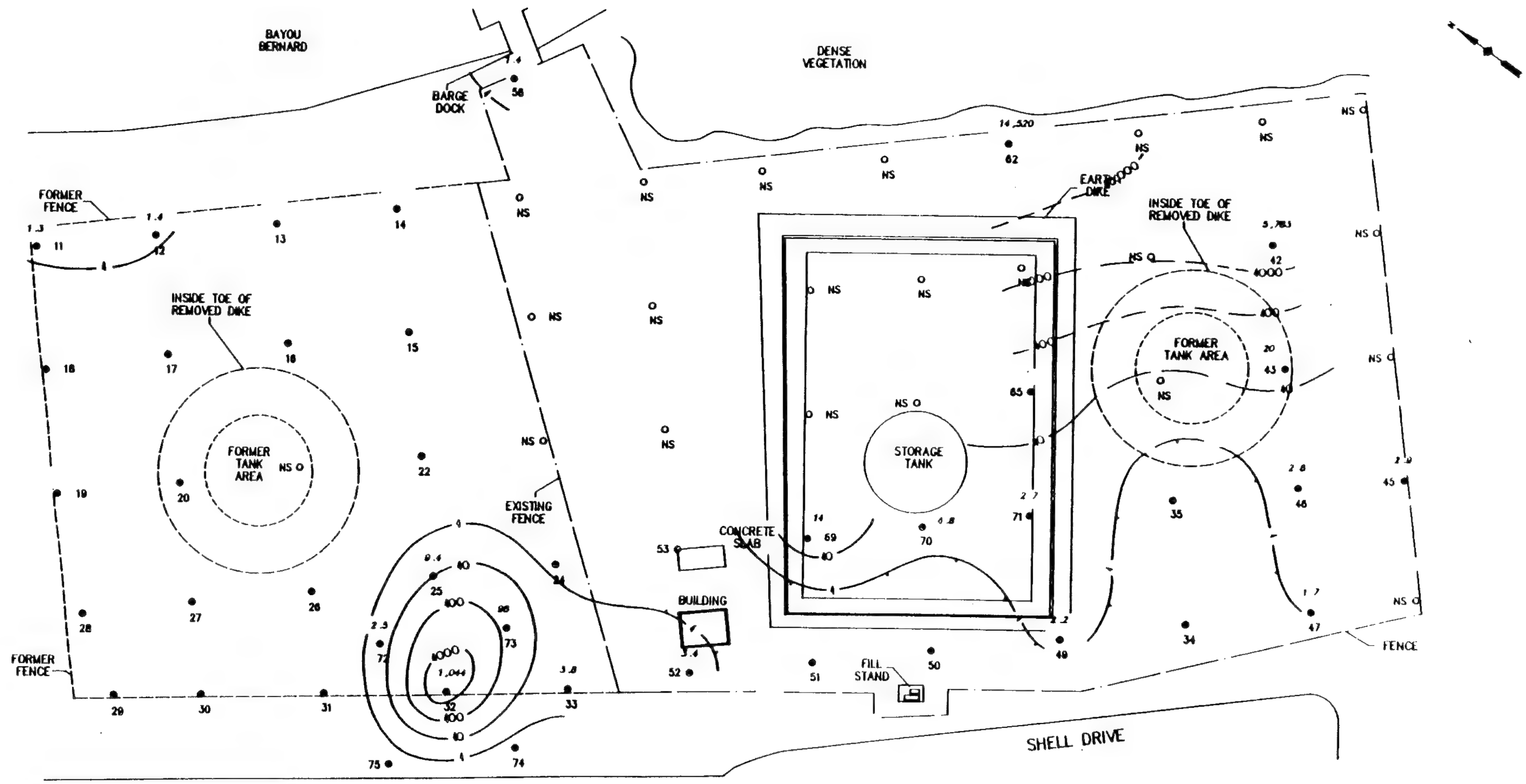

FIGURE 10 Toluene in the Soil Gas ($\mu g/l$)

0 25 50
FEET

● SOIL GAS SAMPLE LOCATION
○ NOT SAMPLED (UNCOLLECTABLE)

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

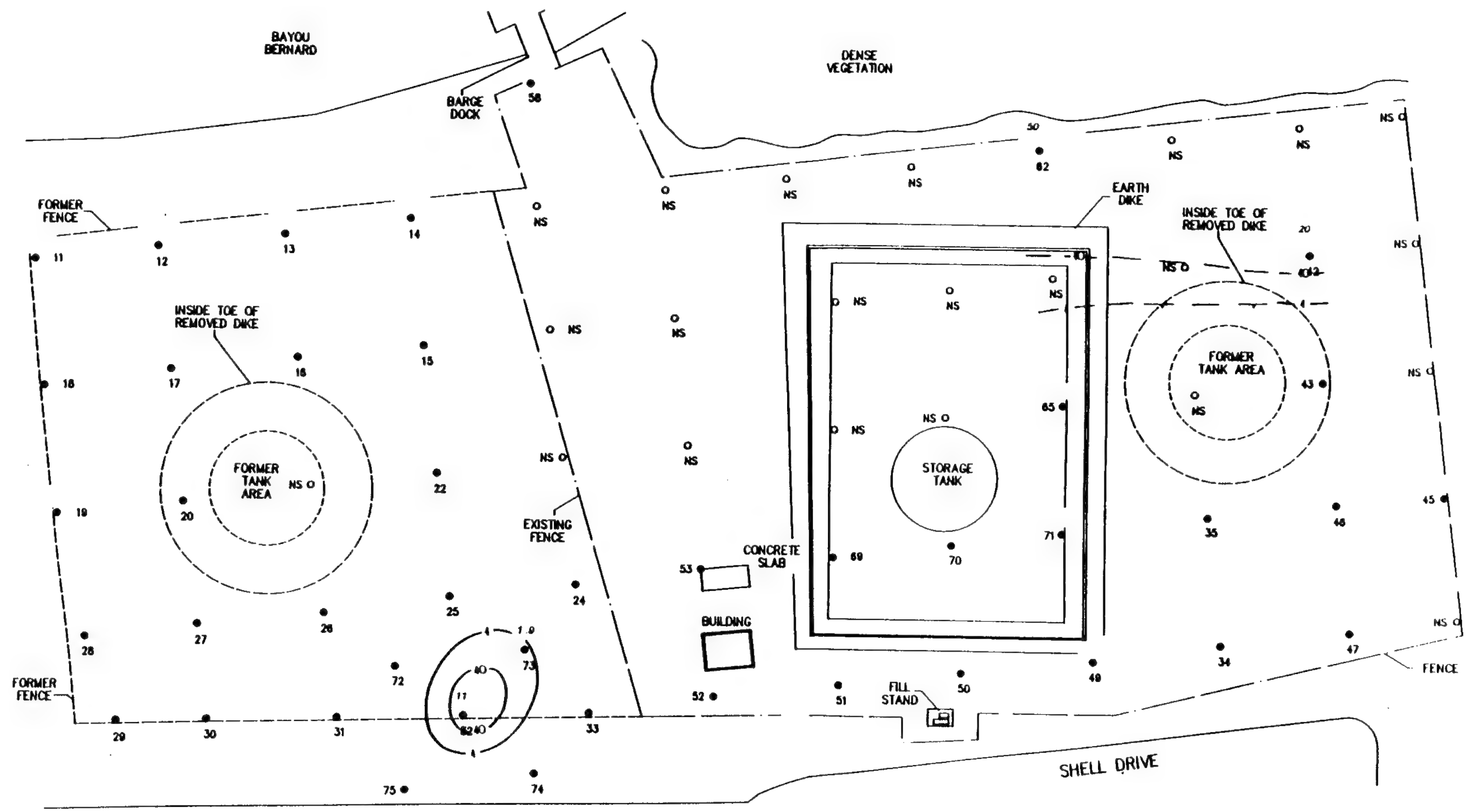

FIGURE 11. Ethylbenzene in the Soil Gas (µg/l)

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GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

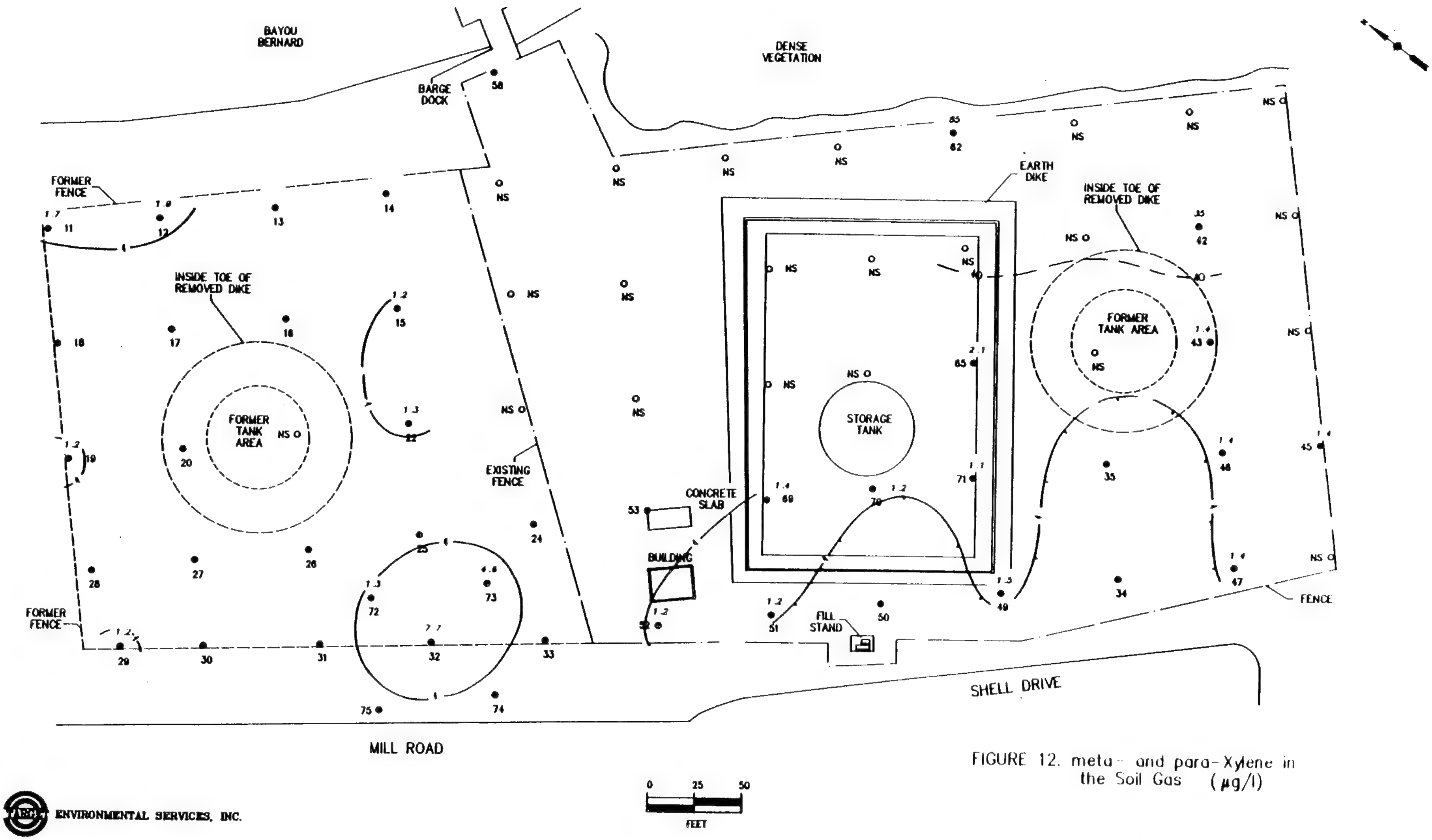

FIGURE 12. meta- and para-Xylene in the Soil Gas ($\mu g/l$)

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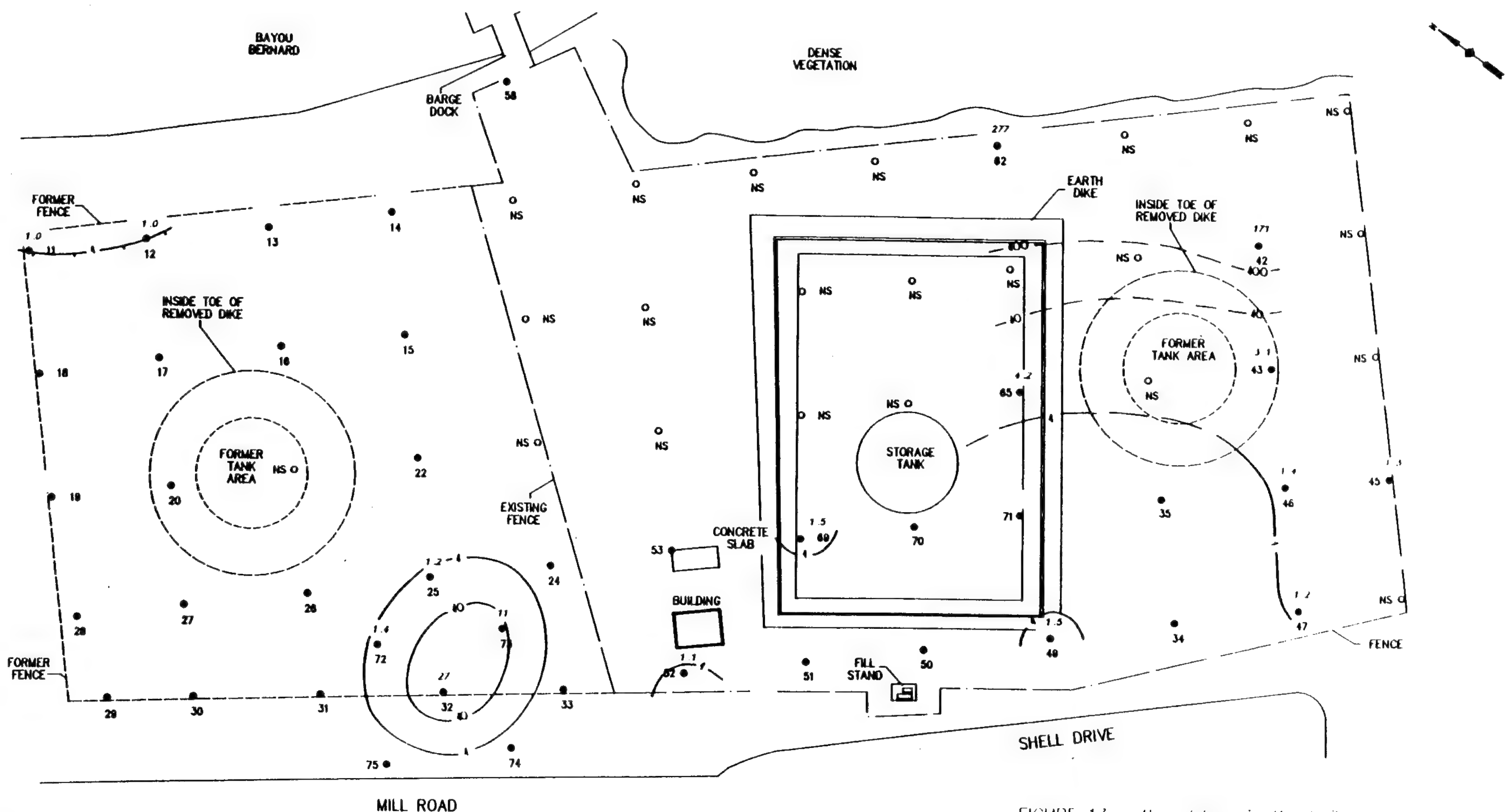
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.



0 25 50

FEET

● SOIL GAS SAMPLE LOCATION

○ NOT SAMPLED (UNCOLLECTABLE)

FIGURE 13. ortho-Xylene in the Soil Gas ($\mu g/l$)

MISSISSIPPI AIR NATIONAL GUARD
GULFPORT FIELD TRAINING SITE
GULFPORT, MISSISSIPPI

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

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Appendix G
Level C Analytical Data
Summary Tables

Table G.1
Sample Results Summary
Background Samples
Gulfport Field Training Site SI, Mississippi ANG
Organics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor/ Smpl Size	Percent Solids	2-Butanone	Acetone	Benzene	Benzoic Acid	Carbon Disulfide	Di-n-butyl-phthalate	Di-n-octyl-phthalate	Methylene Chloride	Toluene	bis-(2-Ethyl-hexyl)-phthalate
CRDL						10 µg/L	10 µg/L	5 µg/L	50 µg/L	5 µg/L	10 µg/L	10 µg/L	5 µg/L	5 µg/L	10 µg/L
BKGD-MW1-1	18551006	05/14/91	WATER	5 mL	NA		7 U			1 J			3 U	1 J	2 J
BKGD-MW1-2	18794005	06/19/91	WATER	5 mL	NA		10 U			92	2 J		300 U	5	
BKGD-MW2-1	18589001	05/20/91	WATER	5 mL	NA		6 U	9					6 U	1 J	
BKGD-MW2-2	18785006	06/18/91	WATER	5 mL	NA		9 U			1 J	2 J		100 U	2 J	3 J
BKGD-MW2-2 DUP	18785007	06/18/91	WATER	5 mL	NA		4 U			160			11 U		3 J
BKGD-MW3-1	18539005	05/10/91	WATER	5 mL	NA		7 U						3 U	1 J	
BKGD-MW3-2	18794007	06/19/91	WATER	5 mL	NA		6 U			3 J	3 J		1100		
CRDL						10 µg/kg	10 µg/kg	5 µg/kg	1600 µg/kg	5 µg/kg	330 µg/kg	330 µg/kg	5 µg/kg	5 µg/kg	330 µg/kg
BKGD-B1-0	18521001	05/08/91	SOIL	5/30 g	84		20 U		120 J		42 J		52 U		160 U
BKGD-B2-4	18572004	05/16/91	SOIL	5/30 g	82	8 BJ	21 U						39 U		
BKGD-B3-1	18470001	05/02/91	SOIL	5/30 g	90		6 U				63 U	140 J	25 U		39 U
BKGD-B3-1 DUP	18470002	05/02/91	SOIL	5/30 g	89		7 U				43 U		190		41 U

Notes - All soil detection limits do not include a correction for sample moisture.
J: Applies to organic data only. Value detected is greater than instrument detection limit but less than the CRDL.
B: Applies to organic data only. Present in the corresponding method blank.
CRDL: Contract Required Detection Limit
U: Common lab contaminant less than five times the CRDL

Table G.1
Sample Results Summary
Background Samples
Gulfport Field Training Site SI, Mississippi ANG
Inorganics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Percent Solids	Arsenic	Soluble Arsenic	Barium	Soluble Barium	Cadmium	Soluble Cadmium	Chromium	Selenium	Soluble Selenium	Lead	Soluble Lead
CRDL					10 µg/L	10 µg/L	200 µg/L	200 µg/L	5 µg/L	5 µg/L	10 µg/L	5 µg/L	5 µg/L	3 µg/L	3 µg/L
BKGD-MW1-1	18551006	05/14/91	WATER	NA	1.7 B	1.8 B	48.7 B	43.8 B						0.92 B	2.9 B
BKGD-MW1-2	18794005	06/19/91	WATER	NA			45 B	25.6 B			9.9 B	1.6 B	1.5 B	10.9	1.8 B
BKGD-MW2-1	18589001	05/20/91	WATER	NA										2.7 B	
BKGD-MW2-2	18785006	06/18/91	WATER	NA	4.6 B		188 B	38.9 B			88	1.8 B		36.8	1.9 B
BKGD-MW2-2 DUP	18785007	06/18/91	WATER	NA	2.9 B		144 B	37.2 B	2.5 B	3.5 B	59.7	0.84 B		27.4	3.2
BKGD-MW3-1	18539005	05/10/91	WATER	NA	4.3 B	1.4 B	68.2 B	44.3 B	6.6	2.2 B	7.8 B			6.9	5
BKGD-MW3-2	18794007	06/19/91	WATER	NA	5.2 B		91 B	52.7 B			15.1	2.0 B		8.7	4.2
CRDL					2 mg/kg	NA	40 mg/kg	NA	1 mg/kg	NA	2 mg/kg	1 mg/kg	NA	0.6 mg/kg	NA
BKGD-B1-0	18521001	05/08/91	SOIL	78.9	0.62 B		2.8 B				2.0 B			7.4	
BKGD-B2-4	18572004	05/16/91	SOIL	76.1	3.4		20.2 B		11.8		9.8			36.8	
BKGD-B3-1	18470001	05/02/91	SOIL	90.4	0.19 B		2.8 B				1.0 B			9.8	
BKGD-B3-1 DUP	18470002	05/02/91	SOIL	90.7	0.42 B		8.1 B				47.9			34.7	

Notes - All soil detection limits do not include a correction for sample moisture.
CRDL: Contract Required Detection Limit
B: Result is less than IDL but greater than the CRDL

Table G.2
Sample Results Summary
Site 1 - Fire Training Area
Gulfport Field Training Site SI, Mississippi ANG
Organics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor\ Smpl Size	Percent Solids	2-Butanone	2-Methylnaphthalene	4-Methyl-2-pentanone	Acetone	Benzene	Benzo(a)-anthracene	Benzo(b)-fluoranthene	Benzoic Acid	Carbon Disulfide	Chloroform	Chrysene	1,2-Dichloroehtane	Di-n-butyl-phthalate
CRDL						10 µg/L	10 µg/L	10 µg/L	10 µg/L	5 µg/L	10 µg/L	10 µg/L	50 µg/L	5 µg/L	5 µg/L	10 µg/L	10 µg/L	10 µg/L
S1-SW2	18505010	05/07/91	WATER	5/1000 mL	NA				6 U									
S1-SW2 DUP	18505011	05/07/91	WATER	5/1000 mL	NA				19 U					60				
S1-SW3	18505012	05/07/91	WATER	5/1000 mL	NA				50 U					8				
S1-MW1-1	18560001	05/15/91	WATER	5/1000 mL	NA				49 U	470							11 J	
S1-MW1-2	18794001	06/19/91	WATER	5/1000 mL	NA				61 U	440				8 J			13 J	4 J
S1-MW1-2 DUP	18794002	06/19/91	WATER	5/1000 mL	NA				54 U	400							12 J	2 J
S1-MW2-1	18572001	05/16/91	WATER	5/1000 mL	NA			1 J	19 U						4 J			
S1-MW2-2	18794003	06/19/91	WATER	5/1000 mL	NA			3 BJ	38 U					14				
S1-MW3-1	18551005	05/14/91	WATER	5/1000 mL	NA				10 U					1 J				
S1-MW3-2	18794004	06/19/91	WATER	5/1000 mL	NA				16 U					5				4 J
CRDL						10 µg/kg	330 µg/kg	10 µg/kg	10 µg/kg	5 µg/kg	330 µg/kg	330 µg/kg	1600 µg/kg	5 µg/kg	5 µg/kg	330 µg/kg	NA	330 µg/kg
S1-SS2-0	18505001	05/07/91	SOIL	5/30 G	78				36 U									
S1-SS2-30	18505002	05/07/91	SOIL	5/30 G	77	14			70 U				250 J					
S1-SS3-0	18505003	05/07/91	SOIL	5/30 G	76				11 U		110 J		280 J			190 J		
S1-SS3-30	18505004	05/07/91	SOIL	5/30 G	82				17 U									
S1-B1-2	18505005	05/07/91	SOIL	5/30 G	77		1100		150 U	560								
S1-B2-0	18505006	05/07/91	SOIL	5/30 G	88		22000		3600									
S1-B2-0 DUP	18505007	05/07/91	SOIL	5/30 G	82		23000		2400	380 J								
S1-B3-4	18505008	05/07/91	SOIL	5/30 G	79				36 U	9		43 J				49 J		

Notes - All soil detection limits do not include a correction for sample moisture
J: Applies to organic data only. Value detected is greater than instrument detection limit but less than the CRDL.
U: Common lab contaminant less than five times the CRDL
CRDL: Contract Required Detection Limit

Table G.2
Sample Results Summary
Site 1 - Fire Training Area
Gulfport Field Training Site SI, Mississippi ANG
Organics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor\ Smpl Size	Percent Solids	Ethyl-benzene	Fluor-anthene	Fluorene	Methylene Chloride	Naphth-alene	Phenan-threne	Phenol	Pyrene	Toluene	Tri-chloro-ethene	Xylenes (total)	bis(2-Ethyl hexyl) phthalate
CRDL						5 µg/L	10 µg/L	10 µg/L	5 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	5 µg/L	5 µg/L	5 µg/L	10 µg/L
S1-SW2	18505010	05/07/91	WATER	5/1000 mL	NA				3 U								
S1-SW2 DUP	18505011	05/07/91	WATER	5/1000 mL	NA				5 U								10 U
S1-SW3	18505012	05/07/91	WATER	5/1000 mL	NA				3 U								
S1-MW1-1	18560001	05/15/91	WATER	5/1000 mL	NA	20 J			52			6 J				33	2 U
S1-MW1-2	18794001	06/19/91	WATER	5/1000 mL	NA	7 J			190					8 J		4 J	
S1-MW1-2 DUP	18794002	06/19/91	WATER	5/1000 mL	NA				150								2 U
S1-MW2-1	18572001	05/16/91	WATER	5/1000 mL	NA				9 U					6			3 U
S1-MW2-2	18794003	06/19/91	WATER	5/1000 mL	NA				100					1 J			2 U
S1-MW3-1	18551005	05/14/91	WATER	5/1000 mL	NA				8 U					2 J			4 U
S1-MW3-2	18794004	06/19/91	WATER	5/1000 mL	NA				12 U					1 J			
CRDL						5 µg/kg	330 µg/kg	330 µg/kg	5 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	5 µg/kg	5 µg/kg	5 µg/kg	330 µg/kg
S1-SS2-0	18505001	05/07/91	SOIL	5/30 G	78				110								220 U
S1-SS2-30	18505002	05/07/91	SOIL	5/30 G	77				85								800 U
S1-SS3-0	18505003	05/07/91	SOIL	5/30 G	76		680		130		260 J		260 J				83 U
S1-SS3-30	18505004	05/07/91	SOIL	5/30 G	82				23 U								86 U
S1-B1-2	18505005	05/07/91	SOIL	5/30 G	77	310			90	680 J						490	
S1-B2-0	18505006	05/07/91	SOIL	5/30 G	88	4400		1100 J	4300	6600					510 J	56,000	520 U
S1-B2-0 DUP	18505007	05/07/91	SOIL	5/30 G	82	2200	280 J	910 J	2900	8600						28,000	330 U
S1-B3-4	18505008	05/07/91	SOIL	5/30 G	79	5 J			21 U	560			110 J			35	710 U

Notes - All soil detection limits do not include a correction for sample moisture
J: Applies to organic data only. Value detected is greater than instrument detectl
U: Common lab contaminant less than five times the CRDL
CRDL: Contract Required Detection Limit

Table G.2
Sample Results Summary
Site 1 - Fire Training Area
Gulfport Field Training Site SI, Mississippi ANG
Inorganics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Percent Solids	Arsenic	Soluble Arsenic	Barium	Soluble Barium	Cadmium	Soluble Cadmium	Chromium	Soluble Chromium	Lead	Soluble Lead	Silver	Selenium	Soluble Selenium
CRDL					**10 µg/L**	**10 µg/L**	**200 µg/L**	**200 µg/L**	**5 µg/L**	**5 µg/L**	**10 µg/L**	**10 µg/L**	**3 µg/L**	**3 µg/L**	**10 µg/L**	**5 µg/L**	**5 µg/L**
S1-SW2	18505010	05/07/91	WATER	NA			30.5 B		6.4				2.1 B			1.8 B	
S1-SW2 DUP	18505011	05/07/91	WATER	NA	0.63 B		33.3 B						6.9			2.4 B	
S1-SW3	18505012	05/07/91	WATER	NA	2.3 B		47 B						46.6			0.94 B	
S1-MW1-1	18560001	05/15/91	WATER	NA	3.0 B	2.9 B	212	212	5.1	5.1	6.6 B	3.8 B	2.6 B	4.7		1.1 B	0.82 B
S1-MW1-2	18794001	06/19/91	WATER	NA	4.1 B	1.4 B	245	186 B			22.4		11.6	3.0 B	10.5	2.2 B	1.8 B
S1-MW1-2 DUP	18794002	06/19/91	WATER	NA	6.0 B	0.8 B	210	162 B	2.7 B		48.3		19.5	9.4		2.0 B	1.3 B
S1-MW2-1	18572001	05/16/91	WATER	NA	3.4 B	3.2 B	115 B	6.5 B	3.3 B		12.4	9.3 B	43.6	2.0 B		2.2 B	1.2 B
S1-MW2-2	18794003	06/19/91	WATER	NA	4.4 B	2.4 B	183 B	150 B	2.5 B		17.0		15.0	7.6		2.6 B	2.2 B
S1-MW3-1	18551005	05/14/91	WATER	NA	2.3 B	2.1 B	32.7 B	28.2 B					2.4 B	3.7			0.85 B
S1-MW3-2	18794004	06/19/91	WATER	NA	3.5 B	0.75 B	79.7 B	31.2 B	2.6 B		29.7		24.4	1.7 B		1.4 B	1.2 B
CRDL					**2 mg/kg**	**NA**	**40 mg/kg**	**NA**	**1 mg/kg**	**NA**	**2 mg/kg**	**NA**	**0.6 mg/kg**	**NA**	**2 mg/kg**	**1 mg/kg**	**NA**
S1-SS2-0	18505001	05/07/91	SOIL	75.4	0.96 B		8.8 B		0.64 B		4.4					0.43 B	
S1-SS2-30	18505002	05/07/91	SOIL	76.1	1.0 B		15.6 B		2.2		4.4		12.1			0.35 B	
S1-SS3-0	18505003	05/07/91	SOIL	61.1	1.5 B		21.1 B				9.7		12.3			1.3 B	
S1-SS3-30	18505004	05/07/91	SOIL	76.7	0.53 B		6.9 B		0.83 B		2.8		6.0			1.1 B	
S1-B1-2	18505005	05/07/91	SOIL	75.7	0.83 B		21.7 B		1.5		4.4		24.0			0.73 B	
S1-B2-0	18505006	05/07/91	SOIL	84.6	0.55 B		13.8 B		2.9		4.4		15.6				
S1-B2-0 DUP	18505007	05/07/91	SOIL	87.9			3.6 B		1.4		1.5 B		6.9			0.50 B	
S1-B3-4	18505008	05/07/91	SOIL	75.6	0.63 B		25.4 B		5.8		3.6		15.1			0.92 B	

Notes - All soil detection limits do not include a correction for sample moisture.
CRDL: Contract Required Detection Limit
B: Result is less than IDL but greater than CRDL

Table G.3
Sample Results Summary
Site 2- JP-4 Bulk Storage Area, Mill Road
Gulfport Field Training Site SI, Mississippi ANG
VOCs

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor/ Smpl Size	Percent Solids	1,1-Di-chloro-ethane	1,1-Di-chloro-ethene	EDB	2-Buta-none	2-Hexa-none	Acetone	Benzene	Carbon disulfide	Chloro-methane	Ethyl-benzene	Methylene Chloride	Toluene	Tri-chloro-ethene	Xylenes (total)
CRDL						5 µg/L	5 µg/L	0.02 µg/L	10 µg/L	10 µg/L	10 µg/L	5 µg/L	5 µg/L	10 µg/L	5 µg/L	5 µg/L	5 µg/L	5 µg/L	5 µg/L
S2-MW1-2	18771001	06/17/91	WATER	5 mL	NA	2 J	1 J	0.11			11 U	1 J	7			690 U	2 J		
S2-MW1-1	18598003	05/20/91	WATER	5 mL	NA	3 J	4 J	0.18			6 U	4 J	9			9 U	2 J		
S2-MW2-2	18771002	06/17/91	WATER	5 mL	NA			0.65			48 U	160	43		47	67 U	19		100
S2-MW2-1	18605003	05/22/91	WATER	5 mL	NA			0.062	23 BJ		78 U	200	9 J		110	35 U	11 J		300
S2-MW3-1	18598002	05/20/91	WATER	5 mL	NA			0.48			43 U	170	51		25	9 U	2 J		5
S2-MW3-2	18785001	06/18/91	WATER	5 mL	NA			0.20			20 U	55	45		7	110	2 J		2 J
S2-MW4-1	18598001	05/21/91	WATER	5 mL	NA						50 U	110	14			8 U	4 J		4 J
S2-MW4-2	18785002	06/18/91	WATER	5 mL	NA						93 U	100	93			620	6		3 J
S2-MW5-1	18589002	05/20/91	WATER	5 mL	NA						86 U	7	56		1 J	9 U	8		4 J
S2-MW5-2	18785003	06/18/91	WATER	5 mL	NA						69 U	23	180			140	7 J		
S2-MW6-1	18605001	05/22/91	WATER	5 mL	NA						14 U	4 J	4 J			5 U			5
S2-MW6-1 DUP	18605002	05/22/91	WATER	5 mL	NA						14 U	3 J	9			13 U			5
S2-MW6-2	18785004	06/18/91	WATER	5 mL	NA					29 U	25 U	9	10		2 J	82			5
CRDL						5 µg/kg	5 µg/kg	0.2 µg/kg	10 µg/kg	10 µg/kg	10 µg/kg	5 µg/kg	5 µg/kg	10 µg/kg	5 µg/kg	5 µg/kg	5 µg/kg	5 µg/kg	5 µg/kg
S2-B1-2	18560007	05/15/91	SOIL	5 g	86						10 U					29 U			
S2-B2-4	18560008	05/15/91	SOIL	5 g	88						1100	42			1300	50 U	12 J		2600
S2-B3-4	18560012	05/15/91	SOIL	5 g	90						150	12			190	32 U			290
S2-B3-4 DUP	18560013	05/15/91	SOIL	5 g	87				64		1100	10 J			350	55 U	180		1800
S2-B4-2	18560005	05/15/91	SOIL	5 g	83				13		240 U					33 U			
S2-B5-4	18560006	05/15/91	SOIL	5 g	81						1100 U	190 J		930 BJ	5100	1800	630 J	190 BJ	11000
S2-B6-2	18560014	05/15/91	SOIL	5 g	73						8 U					20 U			2 J
S2-B7-2	18551001	05/14/91	SOIL	5 g	79						91 U					36 U			2 J
S2-B7-2 DUP	18551002	05/14/91	SOIL	5 g	80						42 U					51 U			
S2-B8-2	18572005	04/16/91	SOIL	5 g	82						1200 U	21 J				210			
S2-B9-2	18572006	04/16/91	SOIL	5 g	84						1100 U		20 J			140			
S2-B10-2	18560002	05/15/91	SOIL	5 g	85						200 U					51 U			
S2-B11-4	18560003	05/15/91	SOIL	5 g	82						28 U					59 U			
S2-B12-2	18560004	05/15/91	SOIL	5 g	85						16 U					87 U			

Notes - All soil detection limits do not include a correction for sample moisture.
J: Applies to organic data only. Value detected is greater than instrument detection limit but less than the CRDL.
U: Common lab contaminant less than five times the CRDL
CRDL: Contract Required Detection Limit

Table G.3
Sample Results Summary
Site 2 - JP-4 Bulk Storage Area, Mill Road
Gulfport Field Training Site SI, Mississippi ANG
SVOCs

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor\ Smpl Size	Percent Solids	2-Methyl naphthalene	Acenaph thene	Anthra cene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Benzoic acid	Chrysene	Di-n-butyl phthalate	Fluor-anthene	Fluorene	Indeno-(1,2,3-cd)-pyrene	Naph-thalene	Phenan-threne	Pyrene	bis-(2-ethylhexyl)-phthalate
CRDL						10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	50 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L	10 µg/L
S2-MW1-2	18771001	06/17/91	WATER	1 L	NA																		22 U
S2-MW1-1	18598003	05/20/91	WATER	1 L	NA																		3 U
S2-MW2-2	18771002	06/17/91	WATER	1 L	NA																		5 U
S2-MW2-1	18605003	05/22/91	WATER	1 L	NA																		
S2-MW3-1	18598002	05/20/91	WATER	1 L	NA																		4 U
S2-MW3-2	18785001	06/18/91	WATER	1 L	NA																		
S2-MW4-1	18598001	05/21/91	WATER	1 L	NA																		7 U
S2-MW4-2	18785002	06/18/91	WATER	1 L	NA																		
S2-MW5-1	18599002	05/20/91	WATER	1 L	NA																		
S2-MW5-2	18785003	06/18/91	WATER	1 L	NA																		
S2-MW6-1	18605001	05/22/91	WATER	1 L	NA																		
S2-MW6-1 DUP	18605002	05/22/91	WATER	1 L	NA											2 J							
S2-MW6-2	18785004	06/18/91	WATER	1 L	NA											9 J							3 U
CRDL						330 µg/kg	330 µg/kg	10 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	1600 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg	330 µg/kg
S2-B1-2	18560007	05/15/91	SOIL	30 g	86																		43 U
S2-B2-4	18560008	05/15/91	SOIL	30 g	88																		
S2-B3-4	18560012	05/15/91	SOIL	30 g	90																		
S2-B3-4 DUP	18560013	05/15/91	SOIL	30 g	87	110 J										54 J				72 J			50 U
S2-B4-2	18560005	05/15/91	SOIL	30 g	83																		43 U
S2-B5-4	18560006	05/15/91	SOIL	30 g	81	120 J	53 J	95 J	210 J	150 J	140 J	60 J	170 J		200 J		460	68 J	78 J	140 J	450	440	63 U
S2-B6-2	18560014	05/15/91	SOIL	30 g	73																		
S2-B7-2	18551001	05/14/91	SOIL	30 g	79				60 J	83 J	120 J		97 J	170 J	86 J		62 J		83 J			71 J	56 U
S2-B7-2 DUP	18551002	05/14/91	SOIL	30 g	80				96 J	130 J	170 J		160 J	200 J	150 J	53 J	150 J		130 J		65 J	160 J	73 U
S2-B8-2	18572005	05/16/91	SOIL	30 g	82																		
S2-B9-2	18572006	05/16/91	SOIL	30 g	84											45 J							
S2-B10-2	18560002	05/15/91	SOIL	30 g	85																		50 U
S2-B11-4	18560003	05/15/91	SOIL	30 g	82																		
S2-B12-2	18560004	05/15/91	SOIL	30 g	85					62 J	57 J		58 J										51 U

Notes - Soil detection limits do not include a correction for sample moisture.
J: Applies to organic data only. Value detected is greater than instrument detection limit but less than the CRDL.
CRDL: Contract Required Detection Limit
B: Applies to inorganic only. Value detected is greater than instrument detection limit but less than the CRDL
U: Common lab contaminant less than five times the CRDL

Table G.3
Sample Results Summary
Site 2 - JP-4 Bulk Storage Area, Mill Road
Gulfport Field Training Site SI, Mississippi ANG
Inorganics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Percent Solids	Arsenic	Barium	Cadmium	Chromium	Lead	Soluble Lead
CRDL					**10 µg/L**	**200 µg/L**	**5 µg/L**	**10 µg/L**	**3 µg/L**	**3 µg/L**
S2-MW1-2	18771001	06/17/91	WATER	NA					19.9	4.5
S2-MW1-1	18598003	05/20/91	WATER	NA					6.3	NA
S2-MW2-2	18771002	06/17/91	WATER	NA					51.1	16.4
S2-MW2-1	18605003	05/22/91	WATER	NA					39.7	NA
S2-MW3-1	18598002	05/20/91	WATER	NA					6.7	NA
S2-MW3-2	18785001	06/18/91	WATER	NA					24.2	3.3
S2-MW4-1	18598001	05/21/91	WATER	NA					14.7	NA
S2-MW4-2	18785002	06/18/91	WATER	NA					23.0	4.8
S2-MW5-1	18589002	05/20/91	WATER	NA					2.2 B	NA
S2-MW5-2	18785003	06/18/91	WATER	NA					24.0	3.0 B
S2-MW6-1	18605001	05/22/91	WATER	NA					16.4	NA
S2-MW6-1 DUP	18605002	05/22/91	WATER	NA					8.9	NA
S2-MW6-2	18785004	06/18/91	WATER	NA					14.1	34.0
CRDL					**2 mg/kg**	**40 mg/kg**	**1 mg/kg**	**2 mg/kg**	**0.6 mg/kg**	**NA**
S2-B1-2	18560007	05/15/91	SOIL	83.1	1.6 B	39.1 B	1.9	11.9	153	
S2-B2-4	18560008	05/15/91	SOIL	85.9	1.1 B	19.6 B	1.1 B	6.8	23.1	
S2-B3-4	18560012	05/15/91	SOIL	86.5	0.95 B	12.4 B		7.6	9.3	
S2-B3-4 DUP	18560013	05/15/91	SOIL	84.7	0.83 B	13.2 B		9 .0	14.5	
S2-B4-2	18560005	05/15/91	SOIL	81.8	2.0 B	20.8 B	1.7	15.0	24.8	
S2-B5-4	18560006	05/15/91	SOIL	87.0	1.2 B	10.0 B	4.3	7.5	10.2	
S2-B6-2	18560014	05/15/91	SOIL	84.2	1.0 B	17.8 B	1.5	14.0	10.9	
S2-B7-2	18551001	05/14/91	SOIL	81.1	0.9 B	11.6 B		3.4	7.6	
S2-B7-2 DUP	18551002	05/14/91	SOIL	79.6	1.4 B	50	0.61 B	3.9	133	
S2-B8-2	18572005	05/16/91	SOIL	80.6	1.5 B	21.0 B	1.1 B	21.7	19.5	
S2-B9-2	18572006	05/16/91	SOIL	77.2	1.3 B	23.8 B	1.3	25.0	9.6	
S2-B10-2	18560002	05/15/91	SOIL	86.5	1.0 B	12.7 B		7.2	29.9	
S2-B11-4	18560003	05/15/91	SOIL	82.6	1.9 B	13.2 B		9.7	34.1	
S2-B12-2	18560004	05/15/91	SOIL	84.2	1.5 B	17.2 B		7.5	19.7	

Notes - Soil detection limits do not include a correction for sample moisture.
CRDL: Contract Required Detection Limit
B: Result is less than IDL but greater than the CRDL

Table G.4
Sample Results Summary
Site 3 - Motor Pool Above-Ground Diesel Storage Tank
Gulfport Field Training Site SI, Mississippi ANG
Organics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Dil Factor\ Smpl Size	Percent Solid	2-Methyl-naphtha-lene	Acetone	Benzoic Acid	Carbon Di-sulfide	Chloro-methane	Di-n-butyl-phthalate	Ethyl-benzene	Fluorene	Methyl-ene Chloride	Naphtha-lene	Phenan-threne	Toluene	Xylenes (total)	bis(2-Ethyl-hexyl)-phthalate
CRDL						**10 µg/L**	**10 µg/L**	**50 µg/L**	**5 µg/L**	**10 µg/L**	**10 µg/L**	**5 µg/L**	**10 µg/L**	**5 µg/L**	**10 µg/L**	**10 µg/L**	**5 µg/L**	**5 µg/L**	**10 µg/L**
S3-MW1-1	18539001	05/10/91	WATER	5/1000 mL	NA		10 U		2 J					7 U					
S3-MW1-1 DUP	18539002	05/10/91	WATER	5/1000 mL	NA		5 U							3 U					
S3-MW1-2	18794006	06/19/91	WATER	5/1000 mL	NA				11		2 BJ			47 U					
CRDL						**330 µg/kg**	**10 µg/kg**	**1600 µg/kg**	**5 µg/kg**	**10 µg/kg**	**330 µg/kg**	**5 µg/kg**	**330 µg/kg**	**5 µg/kg**	**330 µg/kg**	**330 µg/kg**	**5 µg/kg**	**5 µg/kg**	**330 µg/kg**
S3-SS1-4	18463001	05/01/91	SOIL	5/30 g	82	2100	1500			2800 U		2800		1000 U	2200	48 J	490 J	34000	
S3-SS2-4	18463002	05/01/91	SOIL	5/30 g	87		7 U	240 J						42 U					
S3-SS3-4	18463003	05/01/91	SOIL	5/30 g	86	190 J	71 U				48 J		73 J	78 U		100 J			48 U

Notes - Soil detection limits do not include a correction for sample moisture.
J: Applies to organic data only. Value detected is greater than instrument detection limit but less than the CRDL.
B: Applies to organic data only. Present in the corresponding method blank.
U: Common lab contaminant less than five times the CRDL
CRDL: Contract Required Detection Limit

Table G.4
Sample Results Summary
Site 3 - Motor Pool Above-Ground Diesel Storage Tank
Gulfport Field Training Site SI, Mississippi ANG
Inorganics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Percent Solids	Arsenic	Barium	Soluble Barium	Chromium	Lead	Soluble Lead	Soluble Selenium	Soluble Silver	Mercury	Cadmium	Soluble Cadmium
CRDL					10 µg/L	200 µg/L	200 µg/L	10 µg/L	3 µg/L	3 µg/L	5 µg/L	10 µg/L	0.2 µg/L	5 µg/L	5 µg/L
S3-MW1-1	18539001	05/10/91	WATER	NA	0.99 B	83.0 B	92		1.2 B	5.2	1.4 B				3.3 B
S3-MW1-1 DUP	18539002	05/10/91	WATER	NA	1.1 B	90.6 B	87.5		2.1 B	1.9 B		9.5 B		2.4 B	6.9
S3-MW1-2	18794006	06/19/91	WATER	NA					10.5	4.1					
CRDL					2 mg/kg	40 mg/kg	NA	2 mg/kg	0.6 mg/kg	NA	NA	NA	0.1 mg/kg	1 mg/kg	NA
S3-SS1-4	18463001	05/01/91	SOIL	84.3	0.56 B			4.8	27.8					1.1 B	
S3-SS2-4	18463002	05/01/91	SOIL	82.8	0.88 B			4.8	9.5				0.08		
S3-SS3-4	18463003	05/01/91	SOIL	85.0	0.43 B			3.8	15.9						

Notes - Soil detection limits do not include a correction for sample moisture
CRDL: Contract Required Detection Limit
B: Result is less than IDL but greater than CRDL

Table G.5
Organic QC Sample Results Summary
Gulfport Field Training Site, Gulfport, Mississippi

Client Sample ID	Rinsate Source	Lab Sample	Date Sampled	4-Methyl-2-pentanone	Acetone	Bromo-dichloro-methane	Carbon Disulfide	Chloro-form	Dibromo-chloro-methane	Methylene Chloride	bis(2-Ethylhexyl) phthalate
Detection Limits and Units				10 μg/L	10 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	10 μg/L
TB1-5/1		18463005	5/1/91		5 U					7 U	
TB2-5/2		18470003	5/2/91		5 U					3 U	
TB3-5/3		18483004	5/3/91		6 U					7 U	
TB4-5/7		18505009	5/7/91		9 U					4 U	
TB5-5/7		18505014	5/7/91		11 U		2 J			7 U	
TB6-5/8		18521004	5/8/91		10 U					17 U	
TB7-5/9		18531002	5/9/91		10 U					3 U	
TB8-5/10		18539006	5/10/91		11 U					7 U	
TB9-5/14		18551004	5/14/91		8 U					7 U	
TB10-5/15		18560010	5/15/91		9 U					11 U	
TB11-5/15		18560011	5/15/91		9 U					12 U	
TB12-5/16		18572003	5/16/91		5 U					6 U	
TB13-5/17		18582003	5/17/91		11 U					6 U	
TB14-5/20		18589006	6/20/91		8 U					12 U	
TB15-6/21		18598005	6/21/91		8 U					6 U	
TB16-6/22		18605005	6/22/91		8 U					3 U	
TB17-6/17		18771005	6/17/91		8 U					12 U	

Notes: U: Undetected
J: Estimated
TB: Travel Blank
ER: Equipment Rinsate Blank
FB: Field Blank

10012B6D.GNV-1

Table G.5 (cont'd)
Organic QC Sample Results Summary
Gulfport Field Training Site, Gulfport, Mississippi

Client Sample ID	Rinsate Source	Lab Sample	Date Sampled	4-Methyl-2-pentanone	Acetone	Bromo-dichloro-methane	Carbon Disulfide	Chloro-form	Dibromo-chloro-methane	Methylene Chloride	bis(2-Ethylhexyl) phthalate
Detection Limits and Units				10 μg/L	10 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	10 μg/L
TB18-6/18		18785008	6/18/91		10 U					14 U	
TB19-6/19		18794009	6/19/91		9 U					16 U	
ER5-1	Hand-Auger	18463004	5/1/91		9 U		10			9 U	
ER5-2	Split-Spoon	18483002	5/2/91		10 U					4 U	
ER5-8	Hand-Auger	18505013	5/7/91		10 U					6 U	
ER5-10A	Bailer	18539003	5/10/91		6 U					6 U	
ER5-10B	Split-Spoon	18539004	5/10/91		8 U					4 U	
ER5-14	Bailer	18551003	5/14/91	6 J	9 U			1 J		8 U	3 J
ER5-15	Split-Spoon	18560009	5/15/91		8 U		9			12 U	
ER5-16	Hand-Auger	18572002	5/16/91		8 U		5			8 U	
ER5-20	Bailer	18589003	5/20/91		8 U		6			17 U	
ER5-21	Bailer	18598004	5/21/91		7 U					10 U	
ER5-22	Bailer	18605004	5/22/91		7 U		1 J			9 U	
ER6-17	Bailer	18771004	6/17/91		6 U		3 J			29 U	
ER6-18	Bailer	18785005	6/18/91		12 U		12			27 U	
ER6-19	Bailer	18794008	6/19/91		6 U					30 U	

Notes: U: Undetected
J: Estimated
TB: Travel Blank
ER: Equipment Rinsate Blank
FB: Field Blank

10012B6D.GNV-2

Table G.5 (cont'd)
Organic QC Sample Results Summary
Gulfport Field Training Site, Gulfport, Mississippi

Client Sample ID	Rinsate Source	Lab Sample	Date Sampled	4-Methyl-2-pentanone	Acetone	Bromo-dichloro-methane	Carbon Disulfide	Chloro-form	Dibromo-chloro-methane	Methylene Chloride	bis(2-Ethylhexyl) phthalate
Detection Limits and Units				10 μg/L	10 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	5 μg/L	10 μg/L
FB-3A	Lab	18483001	5/3/91		10 U					6 U	
FB5-3B	Tap	18483003	5/3/91		8 U	2 J		3 J	2 J	12 U	
FB5-8A	Water Truck	18521002	5/8/91		5 U	7		90	1 J	5 U	
FB5-8B	Drill Rig	18521003	5/8/91		5 U	3 J		41		6 U	
FB5-9	Lab	18531001	5/9/91		5 U					2 U	
FB5-17A	Tap	18582001	5/17/91		6 U			1 J		6 U	
FB5-17B	Lab	18582002	5/17/91		9 U					24 U	
FB5-20A	Lab	18589004	5/20/91		6 U					13 U	
FB5-20B	Tap	18589005	5/20/91		6 U					8 U	
FB6-17	Lab	18771003	6/17/91		7 U					8 U	

Notes: U: Undetected
J: Estimated
TB: Travel Blank
ER: Equipment Rinsate Blank
FB: Field Blank

10012B6D.GNV-3

Table G.5 (cont'd)
Organic QC Sample Results Summary
Gulfport Field Training Site, Gulfport, Mississippi

Client Sample ID	Lab Sample	Date Sampled	Matrix	Arsenic	Barium	Cadmium	Chromium	Selenium	Lead
CRDL				10 μg/L	200 μg/L	5 μg/L	10 μg/L	5 μg/L	3 μg/L
ER5-1	18463004	5/1/91	Water		1.9 B				2.4 B
ER5-2	18483002	5/2/91	Water		9.9 B	9.6			2.9 B
ER5-8	18505013	5/7/91	Water		6.6 B	5.4		2.8 B	
ER5-10A	18539003	5/10/91	Water	0.7 B	6.0 B	3.1 B			5.9
ER5-10B	18539004	5/10/91	Water	0.96 B	3.1 B			2.6 B	
ER5-14	18551003	5/14/91	Water		5.1 B	3.9 B			2.7 B
ER5-15	18560009	5/15/91	Water		4.2 B	3.3 B	5.0 B		5.2
ER5-16	18572002	5/16/91	Water	1.1 B	103 B		3.2 B		12.6
ER5-20	18589003	5/20/91	Water						2.6 B
ER5-21	18598004	5/21/91	Water						3.1
ER5-22	18605004	5/22/91	Water						1.1 B
ER6-17	18771004	6/17/91	Water		3.1 B	4.2 B			1.2 B
ER6-18	18785005	6/18/91	Water		1.9 B				5.6
ER6-19	18794008	6/19/91	Water		4.5 B			1.4 B	2 B
FB5-3A	18483001	5/30/91	Water		2.2 B				2.0 B
FB5-3B	18483003	5/3/91	Water		7.6 B				14.7
FB5-8A	18521002	5/8/91	Water		14.4 B	7			5.4

Notes: CRDL: Contact Required Detection Limit
B: Analyte concentration is > than IDL, but < CRDL

Table G.5 (cont'd)
Organic QC Sample Results Summary
Gulfport Field Training Site, Gulfport, Mississippi

Client Sample ID	Lab Sample	Date Sampled	Matrix	Arsenic	Barium	Cadmium	Chromium	Selenium	Lead
CRDL				10 μg/L	200 μg/L	5 μg/L	10 μg/L	5 μg/L	3 μg/L
FB5-8B	18521003	5/8/91	Water		19.5 B		3.4 B		31.5
FB5-9	18531001	5/9/91	Water		10.3 B	4.6 B			1.6 B
FB5-17A	18582001	5/17/91	Water	0.92 B	11.1 B				1.9 B
FB5-17B	18582002	5/17/91	Water	1.0 B	6.2 B				.94 B
FB5-20A	18589004	5/20/91	Water						6.4
FB5-20B	18589005	5/20/91	Water						2.1 B
FB6-17	18771003	6/17/91	Water		2.1 B			0.91 B	1.3 B

Notes: CRDL: Contact Required Detection Limit
B: Analyte concentration is > than IDL, but < CRDL

Table G.5
Sample Results Summary
QC
Gulfport Field Training Site SI, Mississippi ANG
Inorganics

Sample ID	Lab Sample ID	Date Sampled	Matrix	Percent Solids	Arsenic	Barium	Cadmium	Chromium	Selenium	Lead
CRDL					10 µg/L	200 µg/L	5 µg/L	10 µg/L	5 µg/L	3 µg/L
ER5-1	18463004	05/01/91	WATER	NA		1.9 B				2.4 B
ER5-2	18483002	05/02/91	WATER	NA		9.9 B	9.6			2.9 B
ER5-8	18505013	05/07/91	WATER	NA		6.6 B	5.4		2.8 B	
EB5-8A	18521002	05/08/91	WATER	NA		14.4 B	7.0			5.4
EB5-8B	18521003	05/08/91	WATER	NA		19.5 B		3.4 B		31.5
ER5-10A	18539003	05/10/91	WATER	NA	0.7 B	6.0 B	3.1 B			5.9
ER5-10B	18539004	05/10/91	WATER	NA	0.96 B	3.1 B			2.6 B	
ER5-14	18551003	05/14/91	WATER	NA		5.1 B	3.9 B			2.7 B
ER5-15	18560009	05/15/91	WATER	NA		4.2 B	3.3 B	5.0 B		5.2
ER5-16	18572002	05/16/91	WATER	NA	1.1 B	103 B		3.2 B		12.6
ER5-20	18589003	05/20/91	WATER	NA						2.6 B
ER5-21	18598004	05/21/91	WATER	NA						3.1
ER5-22	18605004	05/22/91	WATER	NA						1.1 B
ER6-17	18771004	06/17/91	WATER	NA		3.1 B	4.2 B			1.2 B
ER6-18	18785005	06/18/91	WATER	NA		1.9 B				5.6
ER6-19	18794008	06/19/91	WATER	NA		4.5 B			1.4 B	2.0 B
FB5-3A	18483001	05/03/91	WATER	NA		2.2 B				2.0 B
FB5-3B	18483003	05/03/91	WATER	NA		7.6 B				14.7
FB5-9	18531001	05/09/91	WATER	NA		10.3 B	4.6 B			1.6 B
FB5-17A	18582001	05/17/91	WATER	NA	0.92 B	11.1 B				1.9 B
FB5-17B	18582002	05/17/91	WATER	NA	1.0 B	6.2 B				0.94 B
FB5-20A	18589004	05/20/91	WATER	NA						6.4
FB5-20B	18589005	05/20/91	WATER	NA						2.1 B
FB6-17	18771003	06/17/91	WATER	NA		2.1 B			0.91 B	1.3 B

Note - CRDL: Contract Required Detection Limit
B: Result is less than IDL but greater than the CRDL
CRDL: Contract Required Detection Limit

Appendix H
Slug Test Memorandum

TECHNICAL MEMORANDUM CH2M HILL

PREPARED FOR: Mississippi Air National Guard
Gulfport Field Training Site, Meridian, Mississippi

PREPARED BY: Eric Meyer/BTR
Harold Underwood/BTR

COPIES: Janet Ferrill/BTR
Scott Dwyer/SEA
Ann Castleberry/MGM

DATE: November 21, 1991

SUBJECT: Analysis of Slug Test Data from Monitoring Wells
Gulfport Field Training Site, Meridian, Mississippi

PROJECT: MGM27963.A0.RP

Introduction

As part of the Site Investigation (SI) conducted at Gulfport Field Training Site, slug tests were performed on selected partially penetrating 2-inch diameter monitoring wells (BKGD-MW1, BKGD-MW2, S2-MW4, and BKGD-MW3) constructed in the uppermost aquifer. The location of the four wells are shown on Figures 1, 2, and 3.

The monitoring wells were constructed using 2-inch diameter PVC screen and casing. Wells were installed in boreholes drilled using 4.25-inch (7.63-inch O.D.) hollow stem augers. Wells BKGD-MW2, S2-MW4, and BKGD-MW3 were constructed with 5.0-feet, 0.01-inch machine slotted well screen and BKGD-MW1 was constructed with 2.5-feet 0.01-inch machine slotted well screen. Coarse silica sand (20/40 U.S. Sieve) was installed around the well screens, providing an 8-inch diameter envelope of filter sand. A bentonite seal was placed above the filter sand and grout was installed to land surface. Wells were developed upon completion.

Copies of soil boring logs and well completion details are contained in Appendix C and Figure 2.3 of the SI report, respectively.

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8-11-92 MGM27963.AO.RP

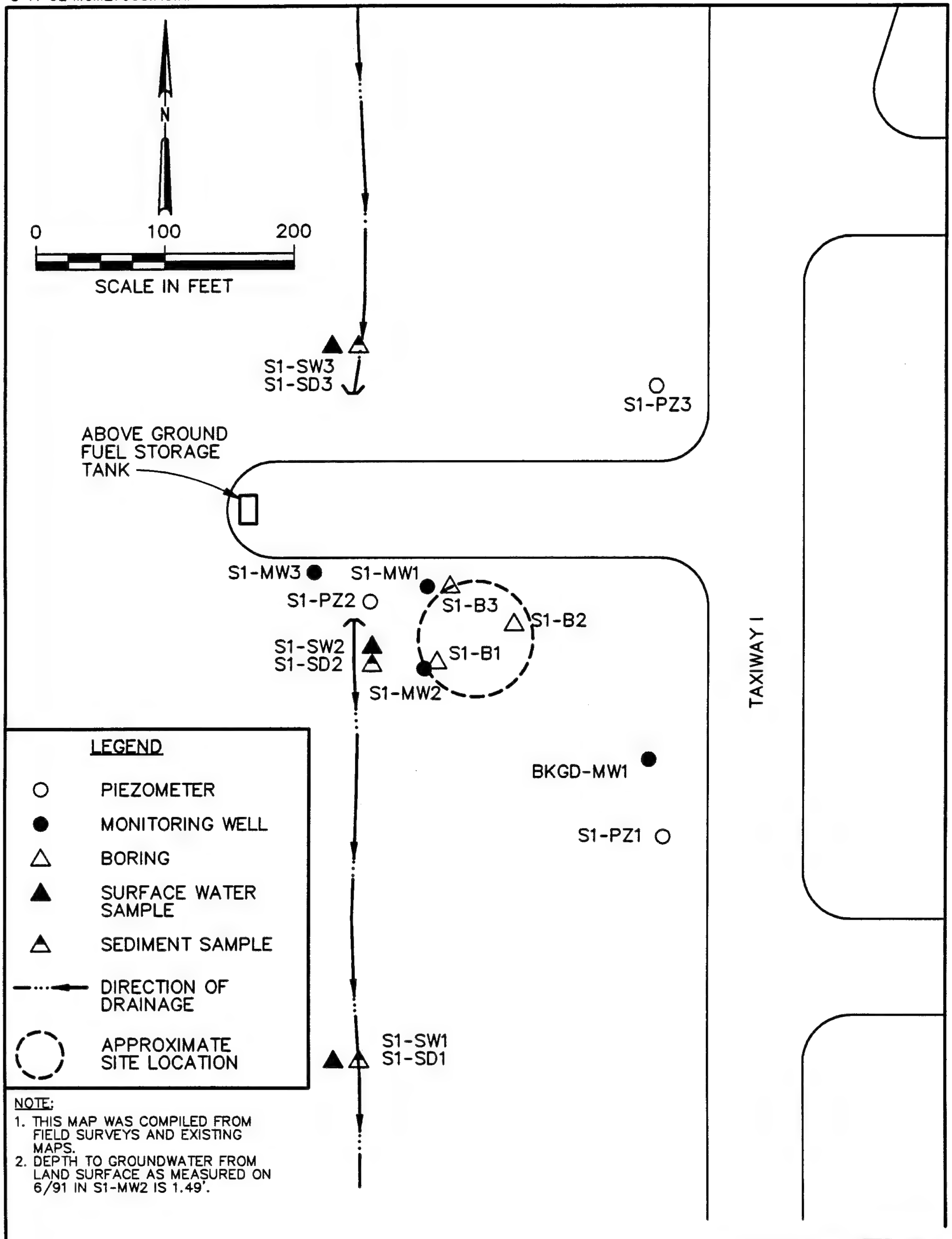

FIGURE H.1
SITE 1 SAMPLE LOCATION MAP
GULFPORT FIELD TRAINING SITE
Gulfport, Mississippi

CH2M HILL

GFP-0048.DWG

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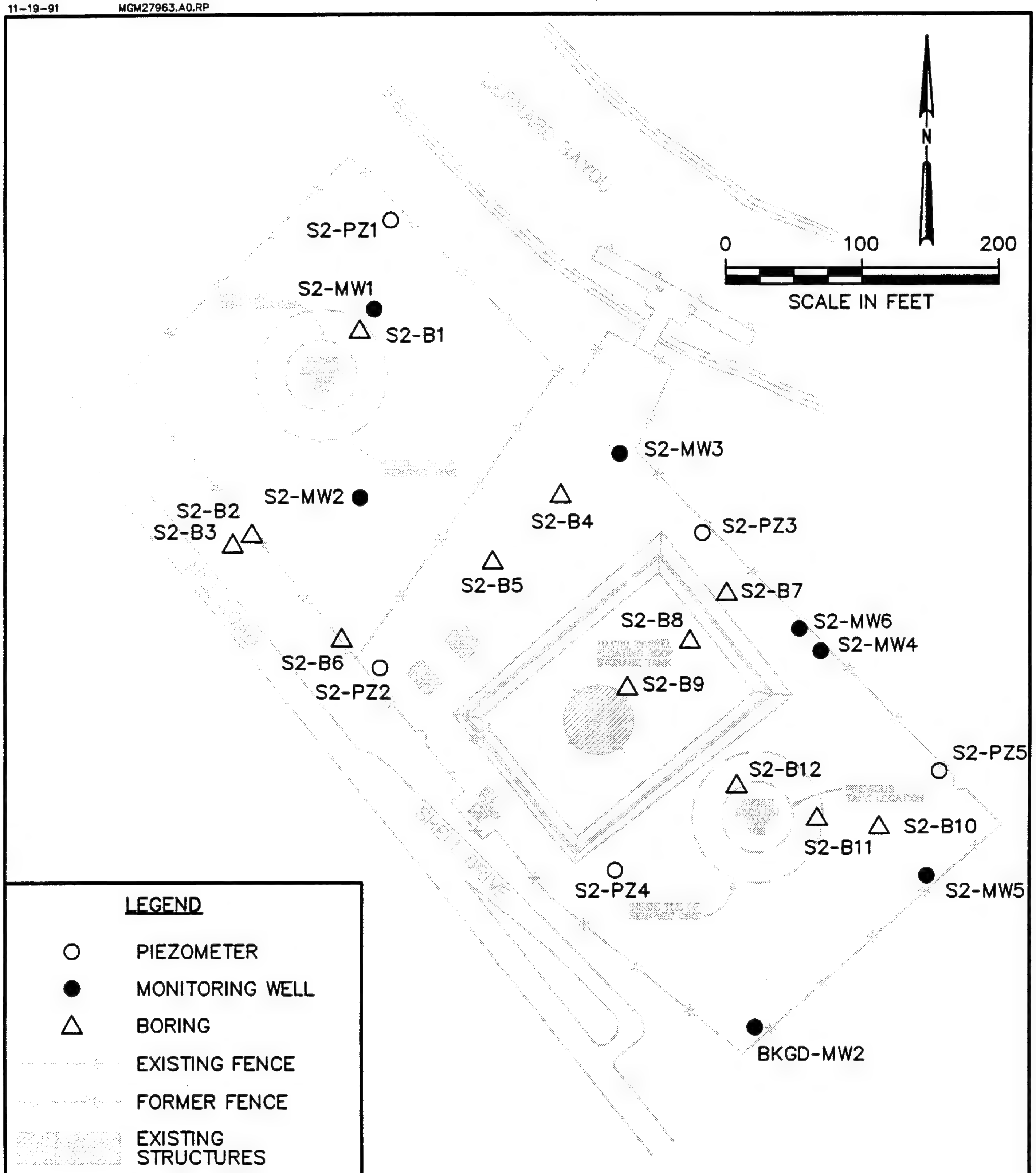

NOTE:
1. THIS MAP WAS COMPILED FROM FIELD SURVEYS AND EXISTING MAPS.
2. DEPTH TO GROUNDWATER FROM LAND SURFACE AS MEASURED ON 6/91 IN S2-MW3 AND BKGD-MW2 ARE 2.51' AND 4.20' RESPECTIVELY.

FIGURE H.2
SITE 2 SAMPLE LOCATION MAP
GULFPORT FIELD TRAINING SITE
Gulfport, Mississippi

CH2M HILL

GFP-0049.DWG

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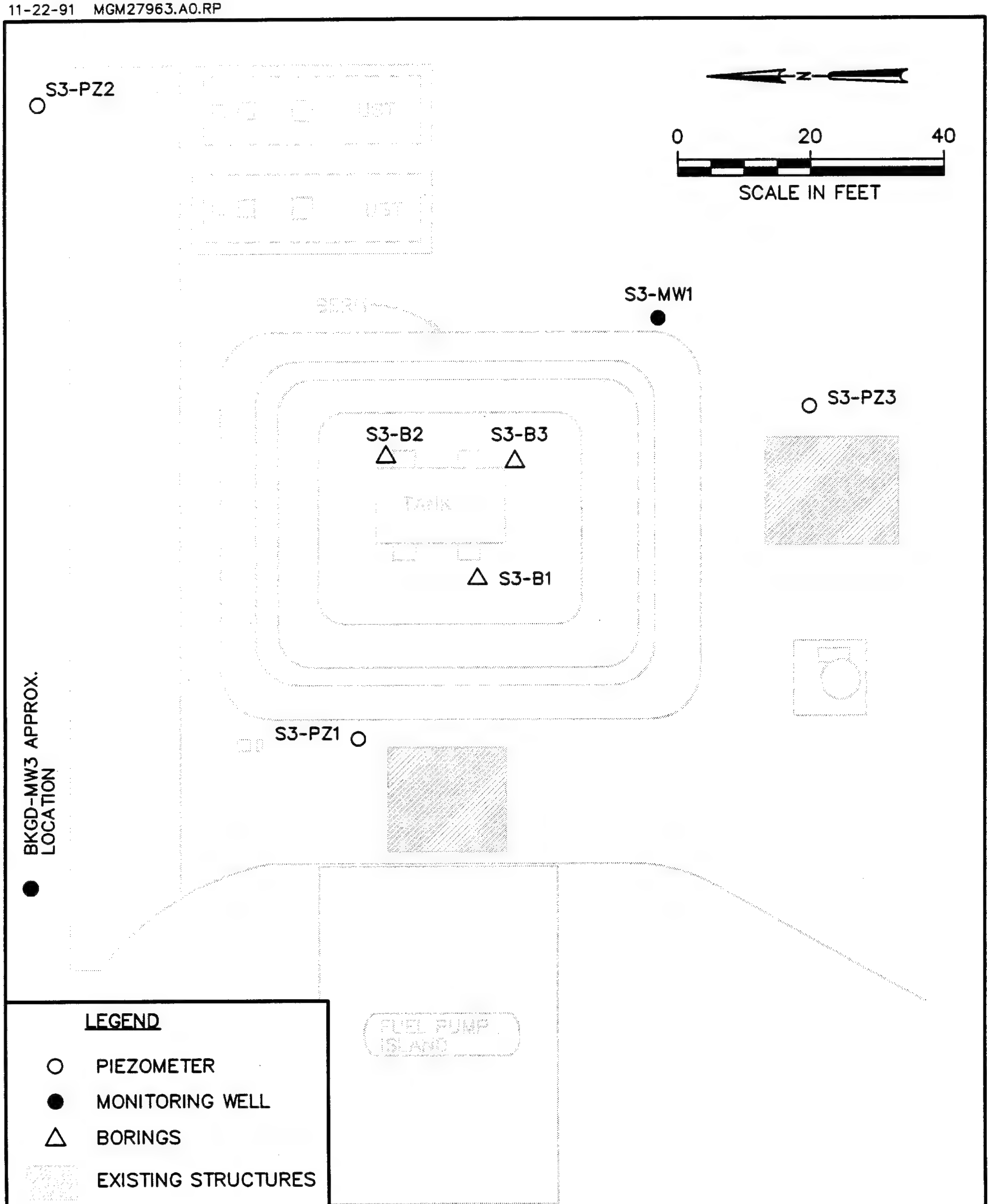
11-22-91 MGM27963.A0.RP



NOTE:
1. THIS MAP WAS COMPILED FROM FIELD SURVEYS AND EXISTING MAPS.
2. DEPTH TO GROUNDWATER FORM LAND SURFACE AS MEASURED ON 6/21 IN S3-MW1 IS 3.1'.

FIGURE H.3
SITE 3 SAMPLE LOCATION MAP
GULFPORT FIELD TRAINING SITE
Gulfport, Mississippi

CH2M HILL

GFP-0050.DWG

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Testing Equipment and Methods

The slug tests were performed on each of the wells described above by rapidly raising or lowering the water in the well by inserting or withdrawing, respectively, a weighted cylinder. The slug used to displace water in the well was fabricated from 1.5-inch PVC pipe.Water levels were recorded during each test using the Enviro-Labs DL-120 data logger with a 15 psi transducer. Data collected during each test were stored in the data logger memory and downloaded into a laptop computer while in the field. Copies of the data plots are found in Attachment 1.

The slug test procedures were as follows:

1. The depth to water from the top of the well casing (TOC) was measured.

2. The well depth from TOC was determined by adding the length of the riser pipe above land surface to the reported well depth.

3. The transducer was placed at the bottom of the well and the cable secured and connected to the data logger.

4. The well water level was monitored using the data logger, then the slug was lowered into the well to raise the water while simultaneously starting the data logger.

5. Once the water level had returned to the static level, the slug was removed from the water, lowering the water level, and the data logger was restarted.

6. Test data were downloaded into a laptop computer.

Test Results

The slug tests were analyzed using the Bouwer and Rice method (See Attachment 2). This method calculates the hydraulic conductivity (K) of partially penetrating wells and is based on the Thiem equation of steady state flow. The results of the slug tests are indicated as K shown in Table 1, and Figure 4 shows the well geometry and corresponding symbols used in the table.

Because of the distance between the location of the wells, a base-wide average K was not determined. Site-specific average K values have been determined. The rising head and falling head test showed similar plots of time vs. change in water level at each site. The data were consistent and yielded a K value of 7.02×10^{-4} cm/sec (1.99 ft/day) at Site 1. K values at Site 2 range from 1.11×10^{-3} to 2.70×10^{-4} cm/sec, which gives a site-wide K log average of 6.82×10^{-4} cm/sec (1.93 ft/day). K values at Site 3

TABLE 1
SLUG TEST ANALYSIS FOR MONITORING WELLS
GULFPORT, MISSISSIPPI
MGM27963.A0.FW

WELL No.	WELL RADIUS Rc,(ft)	WELL DEPTH BLS (ft)	TOC/ WELL SEAL ELEV. (NGVD)	GROUND ELEV (NGVD)	DTW FROM TOC (ft)	COMPUTED DTW BLS (ft)	COMPUTED WELL DEPTH BELOW WATER H,(ft)	SCREEN LENGTH L,(ft)	BORHOLE RADIUS Rw,(ft)	APPROX. SAT. THICK. D,(ft)	COMPUTED Ln [(D-Lw)/Rw]	L/Rw	COEF. A	COEF. B	COMPUTED Ln(Re/Rw)
52-MW4	0.0833	16	6.30	3.6	4.61	1.71	14.29	5.0	0.359	100	5.47	13.91	1.9	0.25	1.874
BKGD-MW1	0.0833	12	24.48	21.5	4.05	1.07	10.93	2.5	0.359	100	5.51	6.96	1.9	0.25	1.261
BKGD-MW2	0.0833	30	9.50	5.4	7.30	4.20	25.80	5.0	0.359	100	5.33	13.93	1.9	0.25	2.043
BKGD-MW3	0.0833	22	22.81	22.9	3.32	3.41	18.59	5.0	0.359	100	5.42	13.93	1.9	0.25	1.951

WELL No.	FALLING HEAD	RISING HEAD	Yo AT TIME ZERO (ft)	SELECTED TIME T (sec)	Yt AT TIME T (ft)	HYD. COND, K (cm/sec)	HYD. COND., K (ft/day)
52-MW4	X		1.80	90.00	0.20	9.68E-04	2.74
		X	2.70	40.00	0.87	1.12E-03	3.18
52-MW4	X		2.20	30.00	0.93	1.11E-03	3.14
(TEST 2)		X	3.3	30	0.76	1.94E-03	5.50
52-MW4	X		2.10	30.00	0.55	1.77E-03	5.02
(TEST 3)		X	3.00	40.00	0.90	1.19E-03	3.38
BKGD-MW1							
		X	1.10	40.00	0.65	7.02E-04	1.99
BKGD-MW2	X		1.70	20.00	1.50	2.70E-04	0.77
		X	1.70	60.00	1.00	3.82E-04	1.08
BKGD-MW2	X		1.40	30.00	1.00	4.85E-04	1.37
(TEST 2)		X	1.70	70.00	1.00	3.28E-04	0.93
BKGD-MW3	X		3.40	60.00	2.10	3.31E-04	0.94
(TEST 1)		X	5.90	70.00	3.00	3.99E-04	1.13
BKGD-MW3	X		5.50	70.00	2.10	5.68E-04	1.61
(TEST 2)		X	2.80	50.00	1.00	8.20E-04	2.32

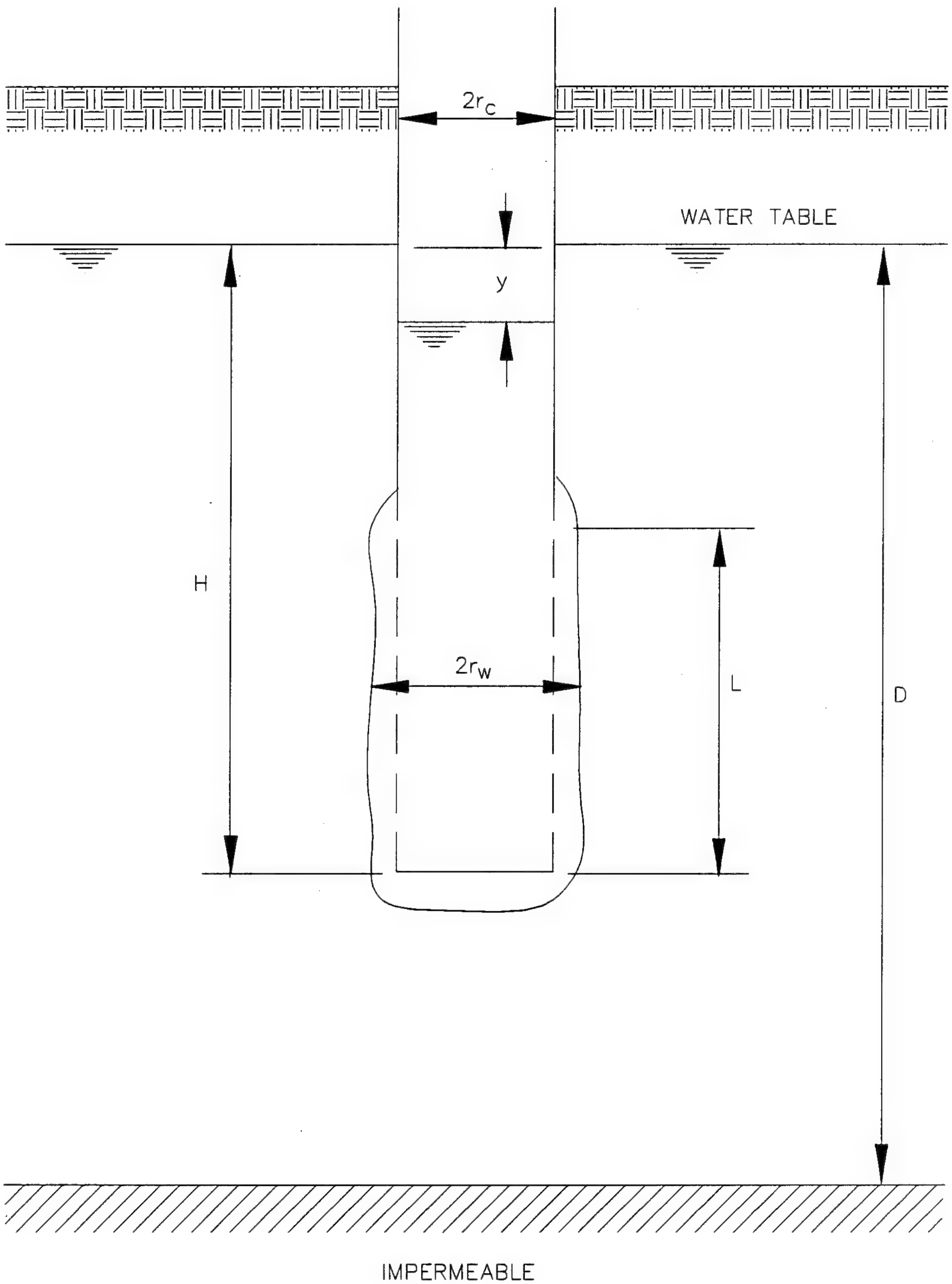

FIGURE 4
WELL GEOMETRY AND SYMBOLS
Gulfport Field Training Site, Gulfport, Mississippi

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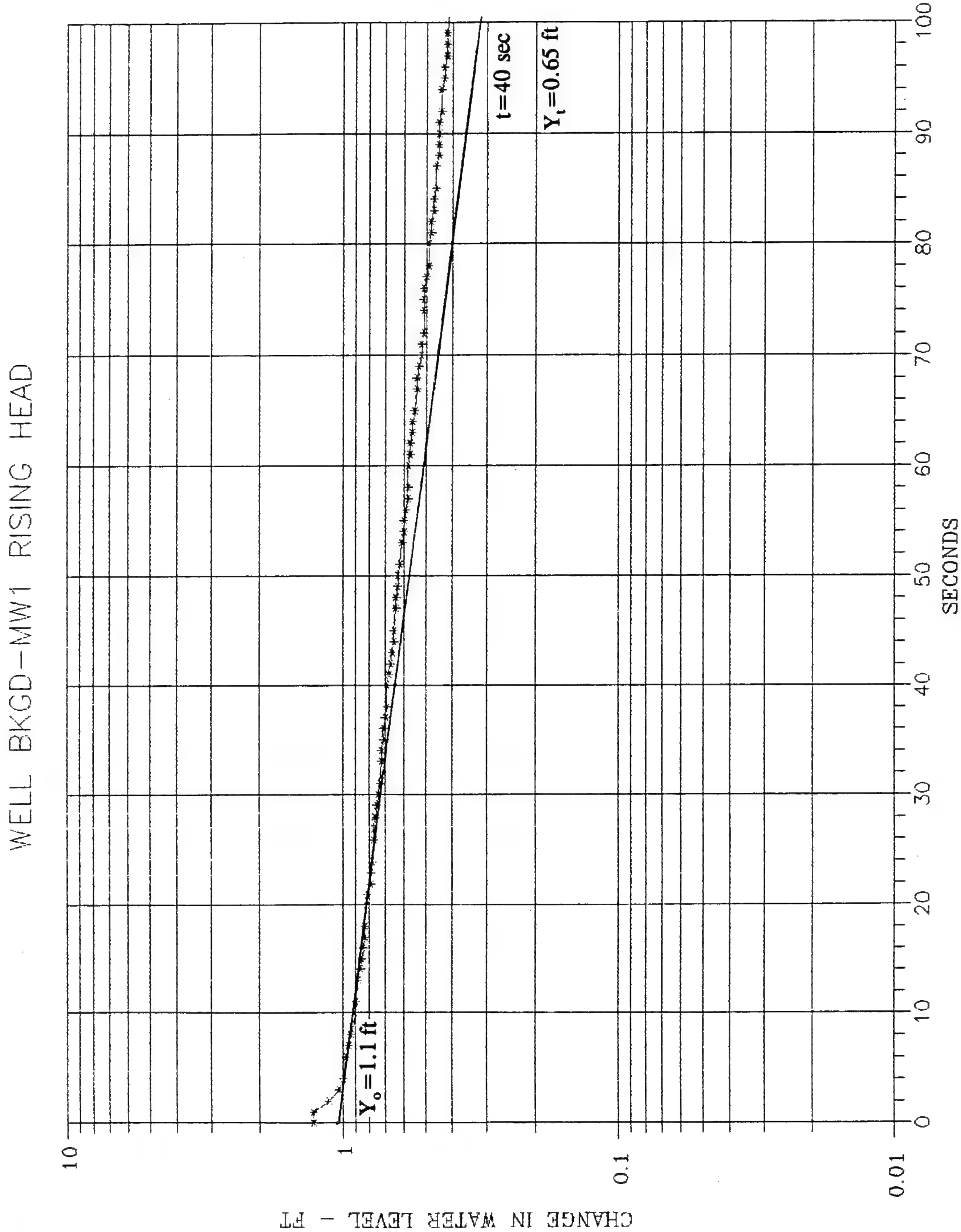
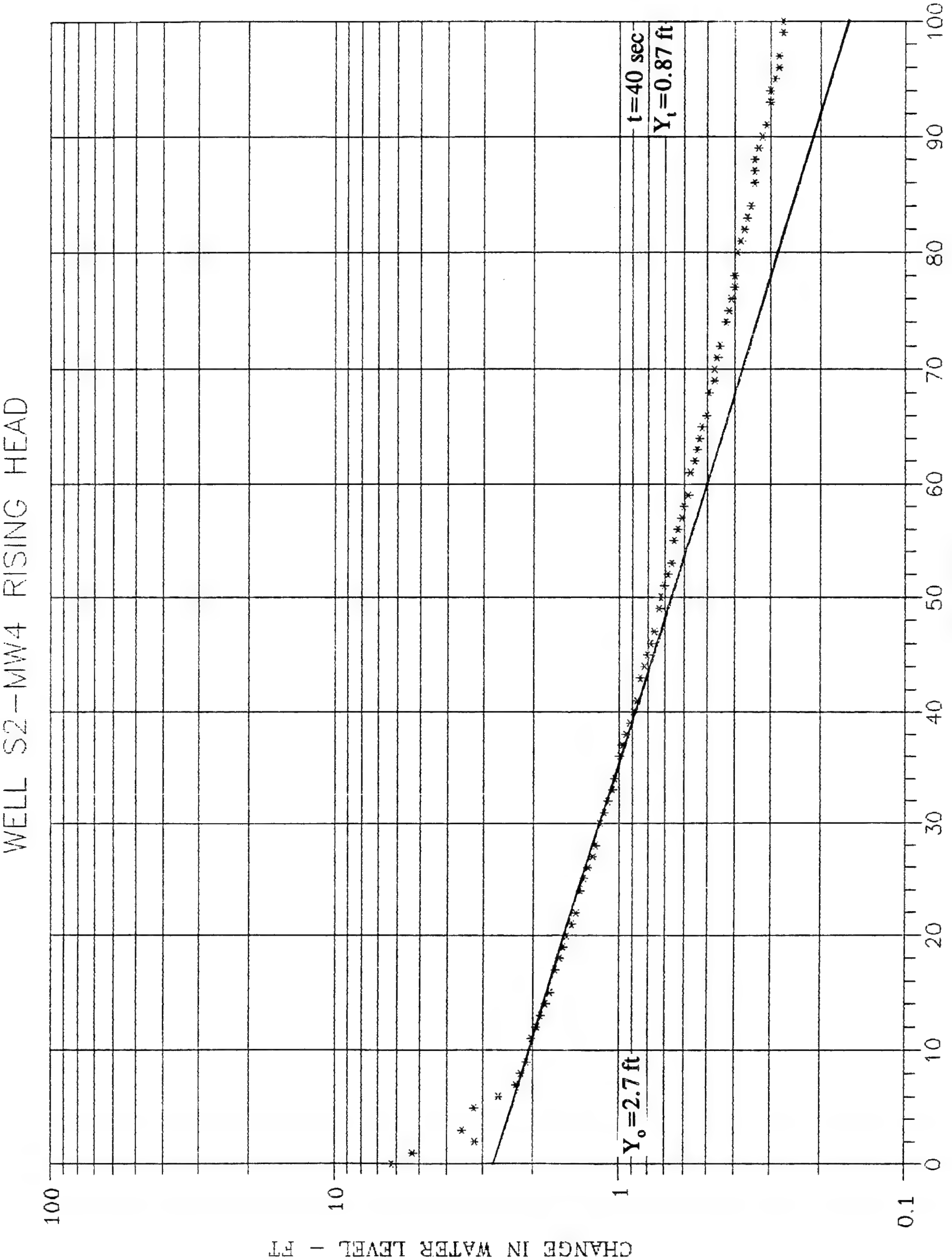
range from 3.31 x 10^{-4} to 8.20 x 10^{-4} cm/sec, which gives a K log average 4.98 x 10^{-4} cm/sec (1.41 ft/day).

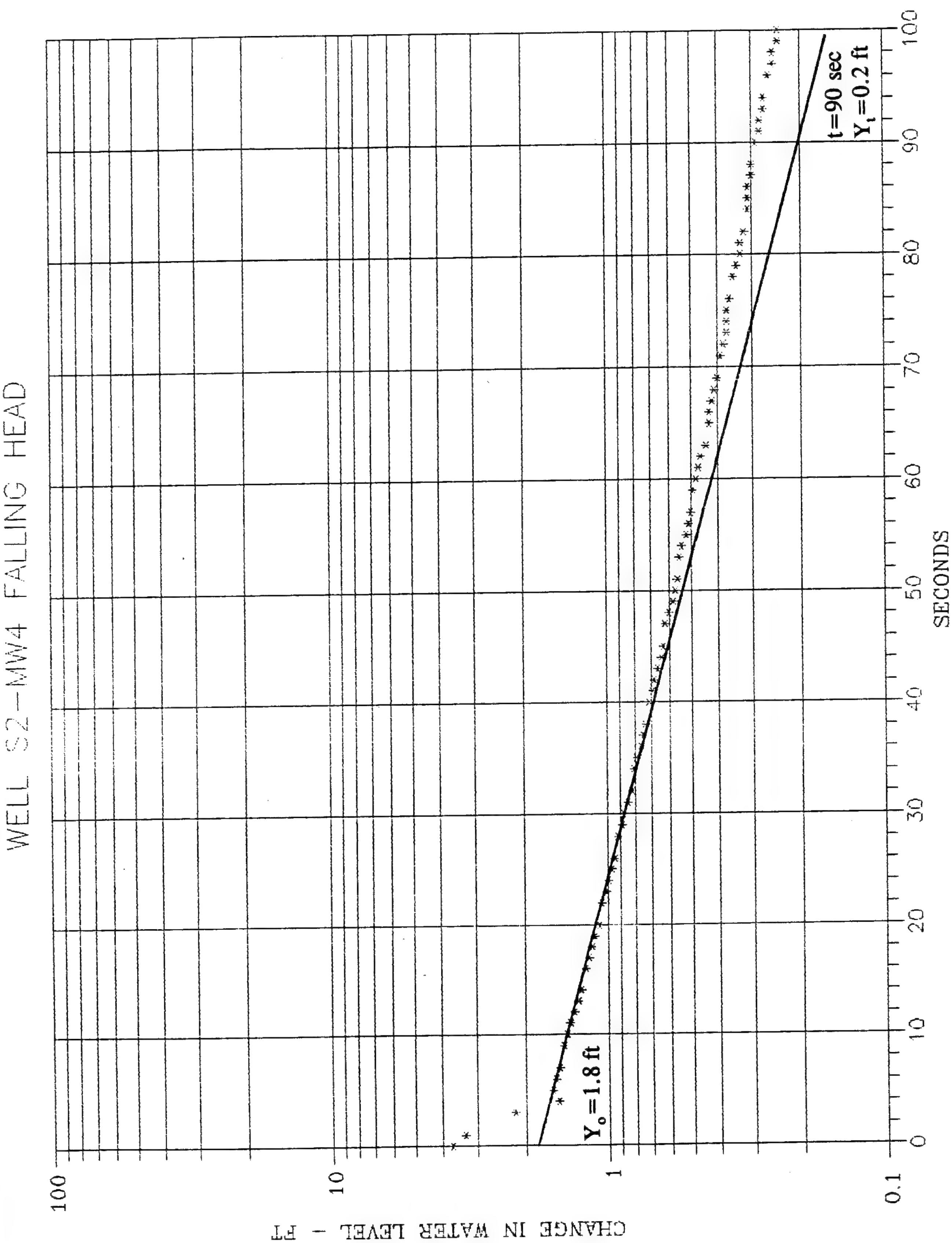
The interval of screen and filter sand in these wells is completely submerged. This prevented the displacement of water into the filter sand without minimal effect on the formation during the slug test.

Attachment 1
Slug Test Data Plots

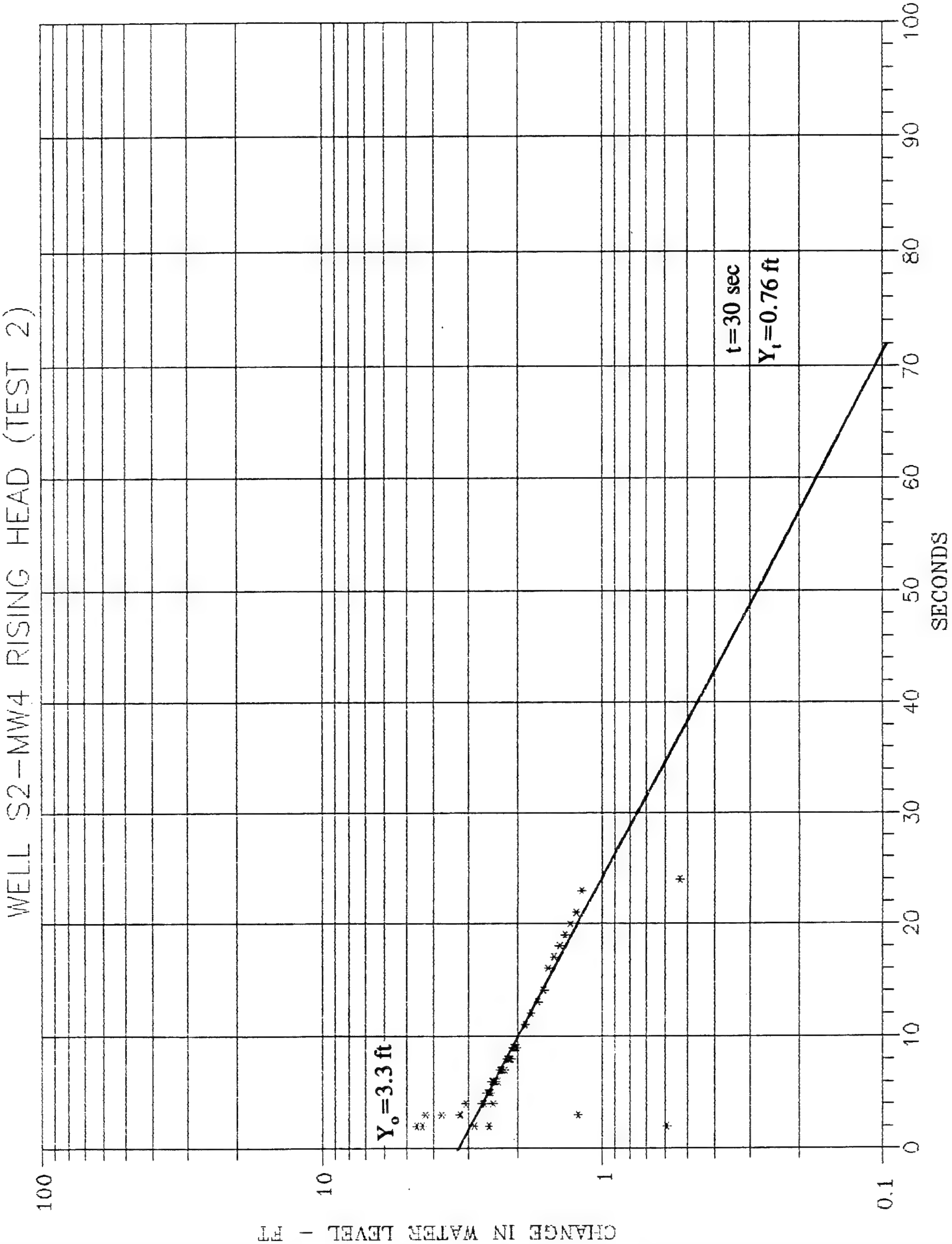


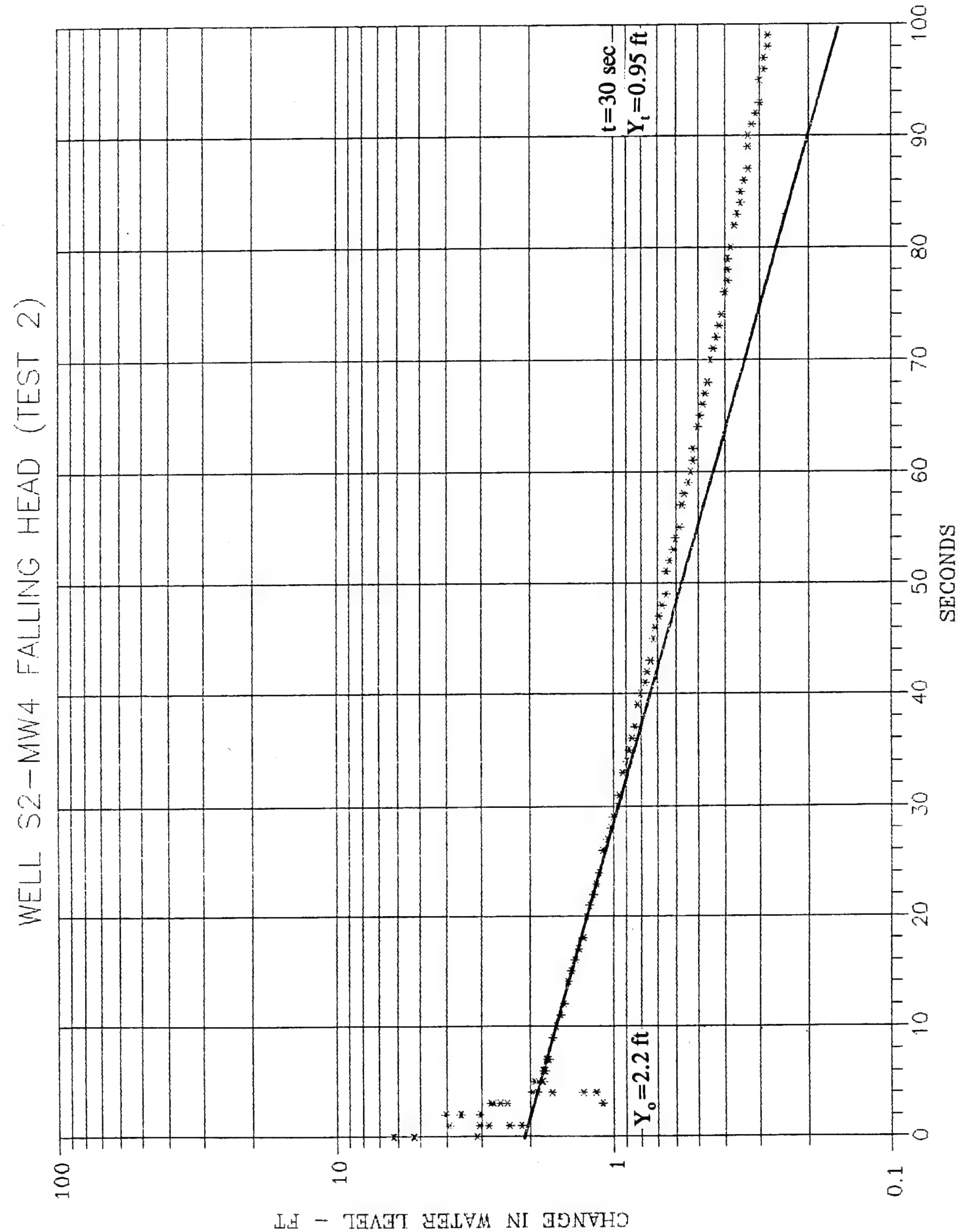
WELL BKGD-MW1 RISING HEAD
t=40 sec
Y_t=0.65 ft
Y_o=1.1 ft
0
10
20
30
40
50
60
70
80
90
100
SECONDS
10
1
0.1
0.01
CHANGE IN WATER LEVEL – FT

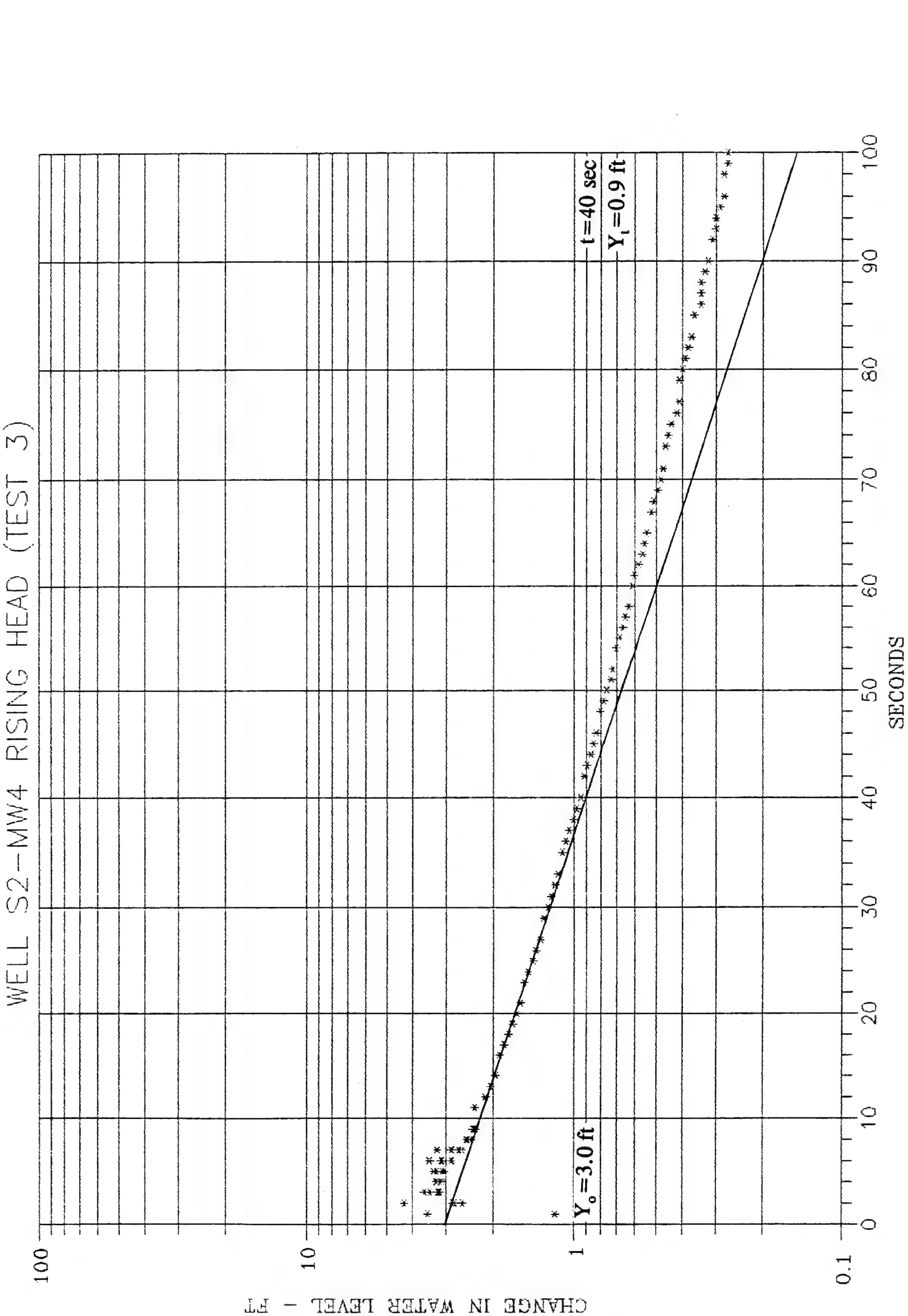

WELL S2-MW4 RISING HEAD
t=40 sec
Y_t=0.87 ft
Y_o=2.7 ft
SECONDS
CHANGE IN WATER LEVEL - FT
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100



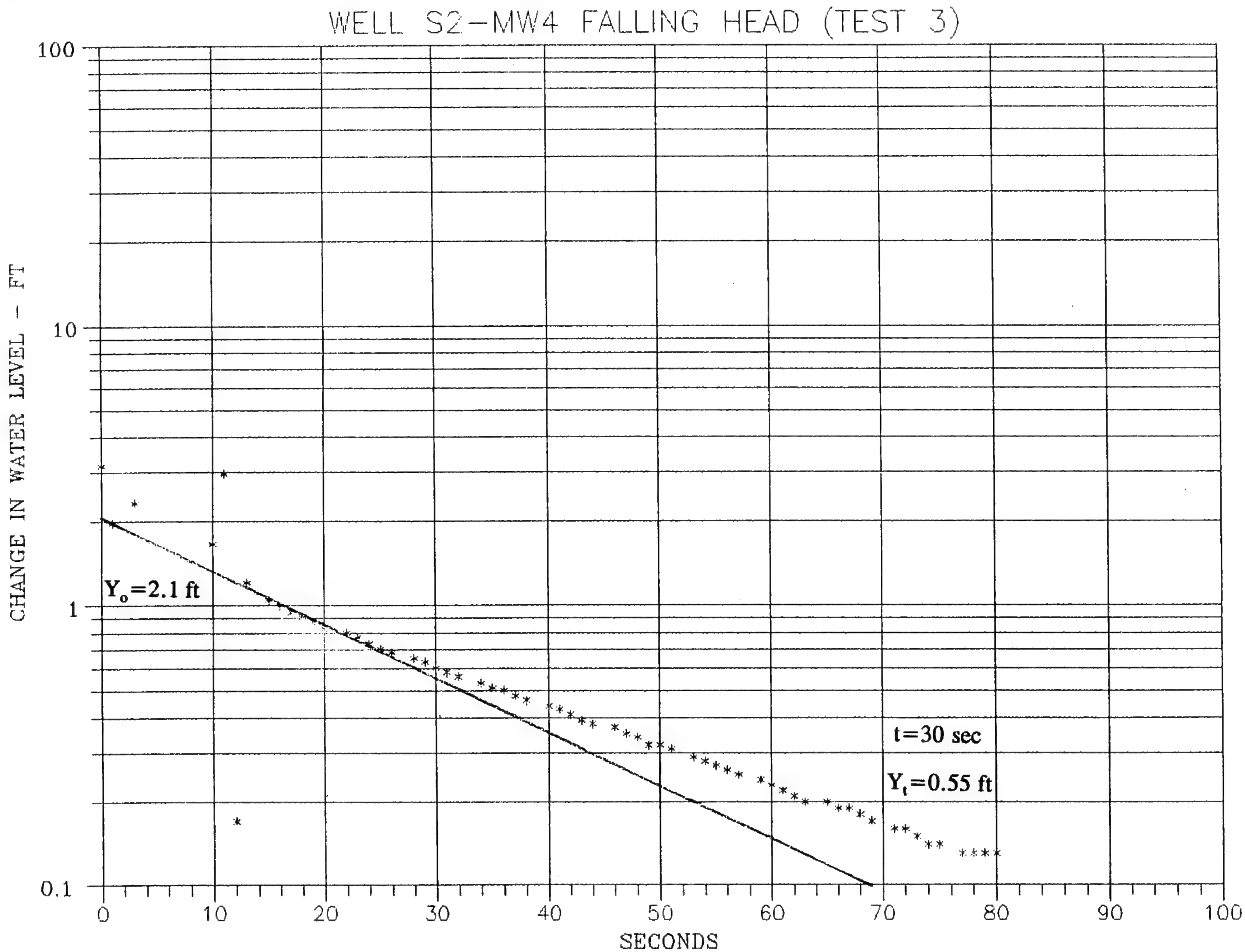
WELL S2-MW4 FALLING HEAD
CHANGE IN WATER LEVEL - FT
SECONDS
Y_o=1.8 ft
t=90 sec
Y_t=0.2 ft
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100


WELL S2-MW4 RISING HEAD (TEST 2)
Y_o=3.3 ft
t=30 sec
Y_t=0.76 ft
SECONDS
0
10
20
30
40
50
60
70
80
90
100
CHANGE IN WATER LEVEL - FT
100
10
1
0.1


WELL S2-MW4 FALLING HEAD (TEST 2)
t=30 sec
Y_t=0.95 ft
Y_o=2.2 ft
SECONDS
CHANGE IN WATER LEVEL - FT
0
10
20
30
40
50
60
70
80
90
100
0.1
1
10
100

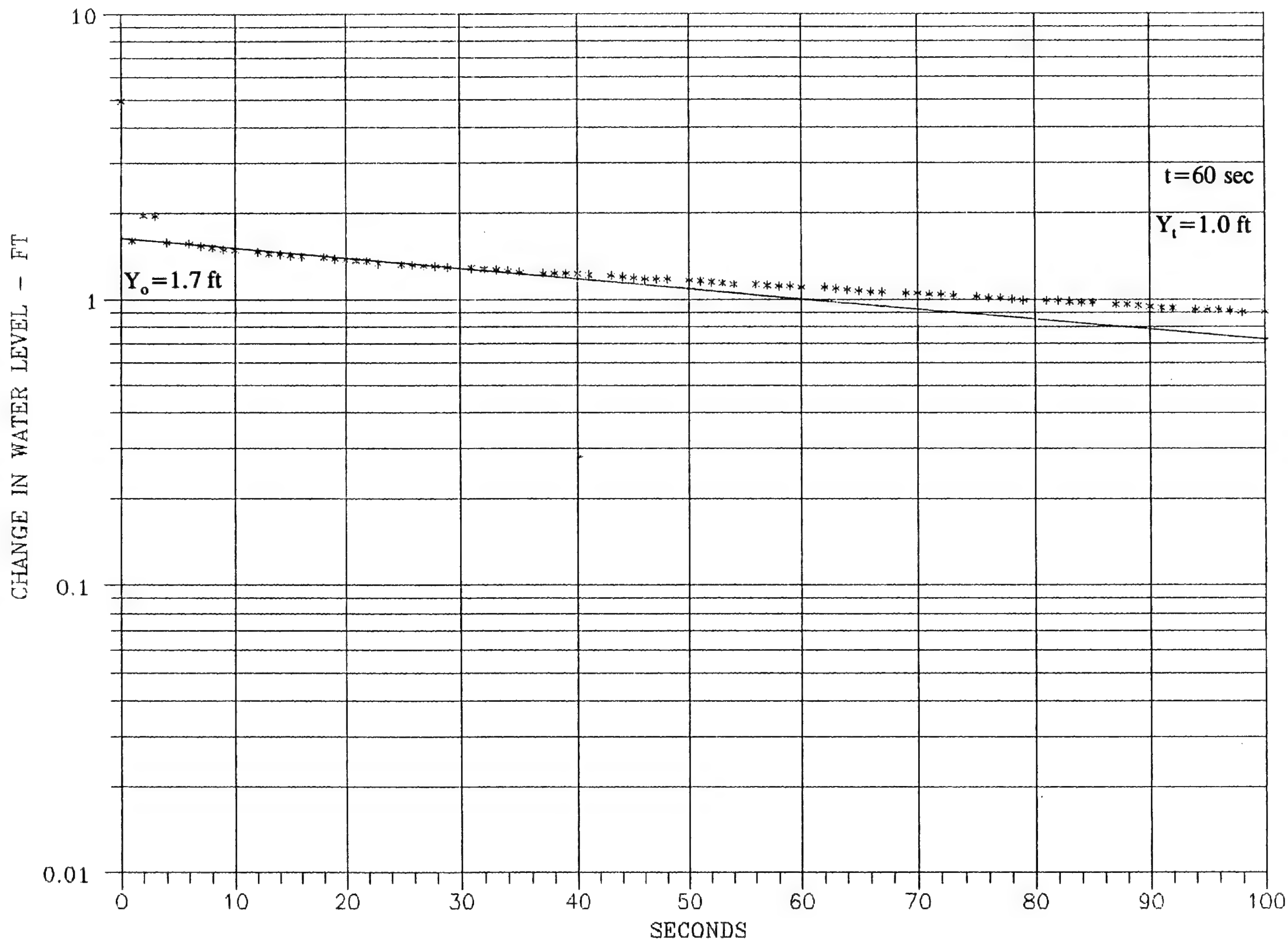


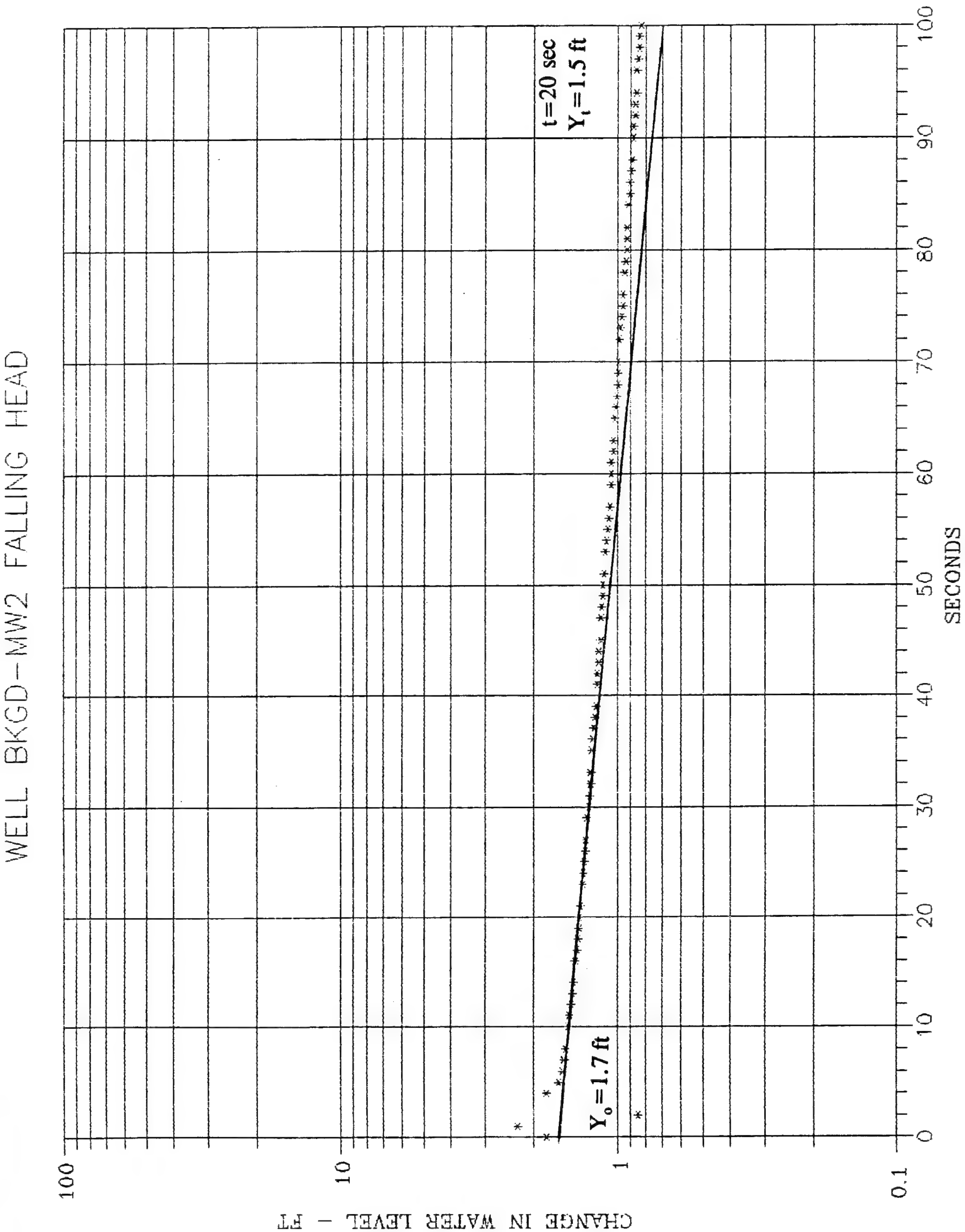
WELL S2-MW4 RISING HEAD (TEST 3)
t=40 sec
Y_t=0.9 ft
Y_o=3.0 ft
CHANGE IN WATER LEVEL - FT
SECONDS
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100



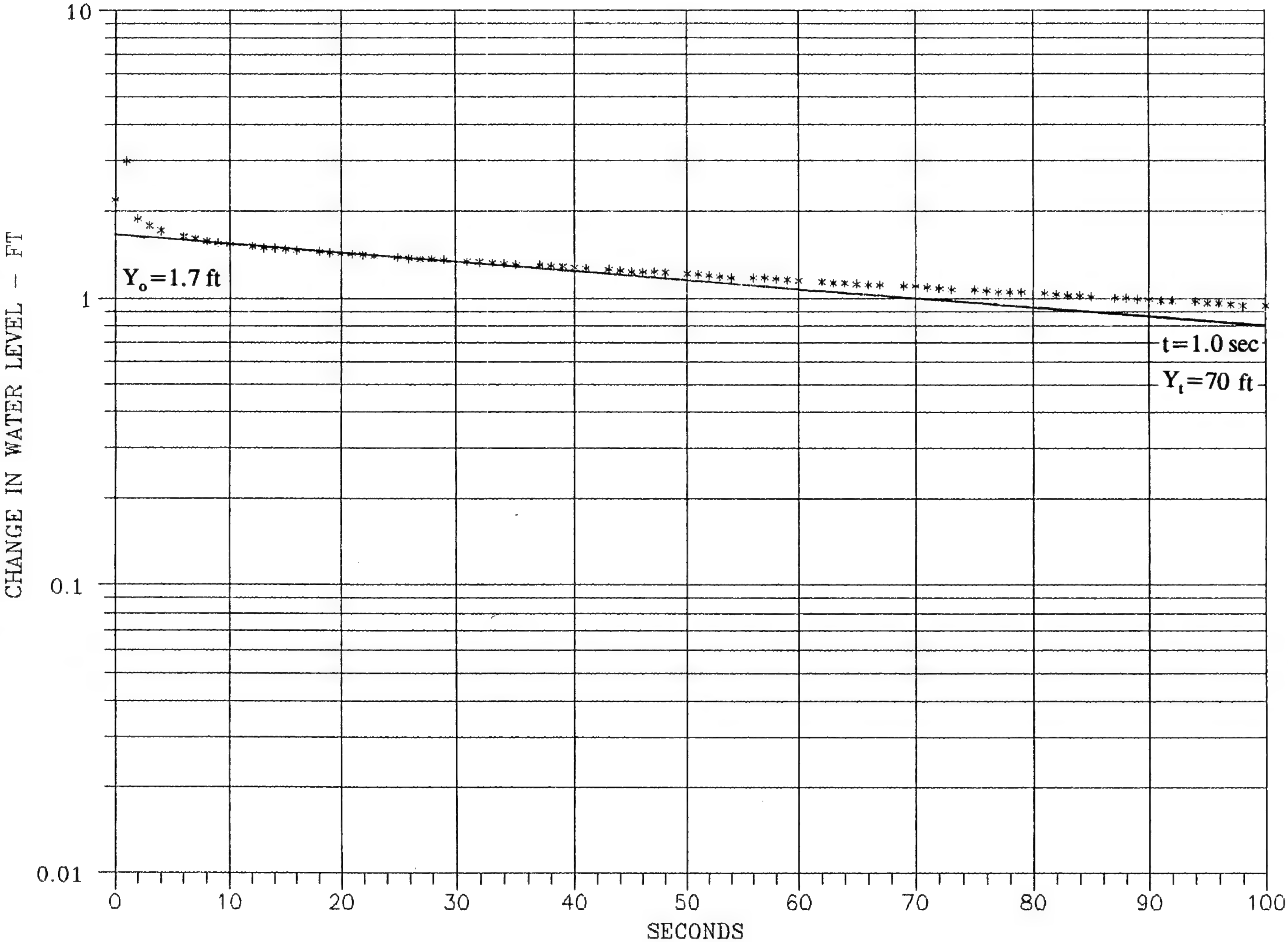
WELL S2-MW4 FALLING HEAD (TEST 3)
CHANGE IN WATER LEVEL - FT
SECONDS
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100
Y_o=2.1 ft
t=30 sec
Y_t=0.55 ft

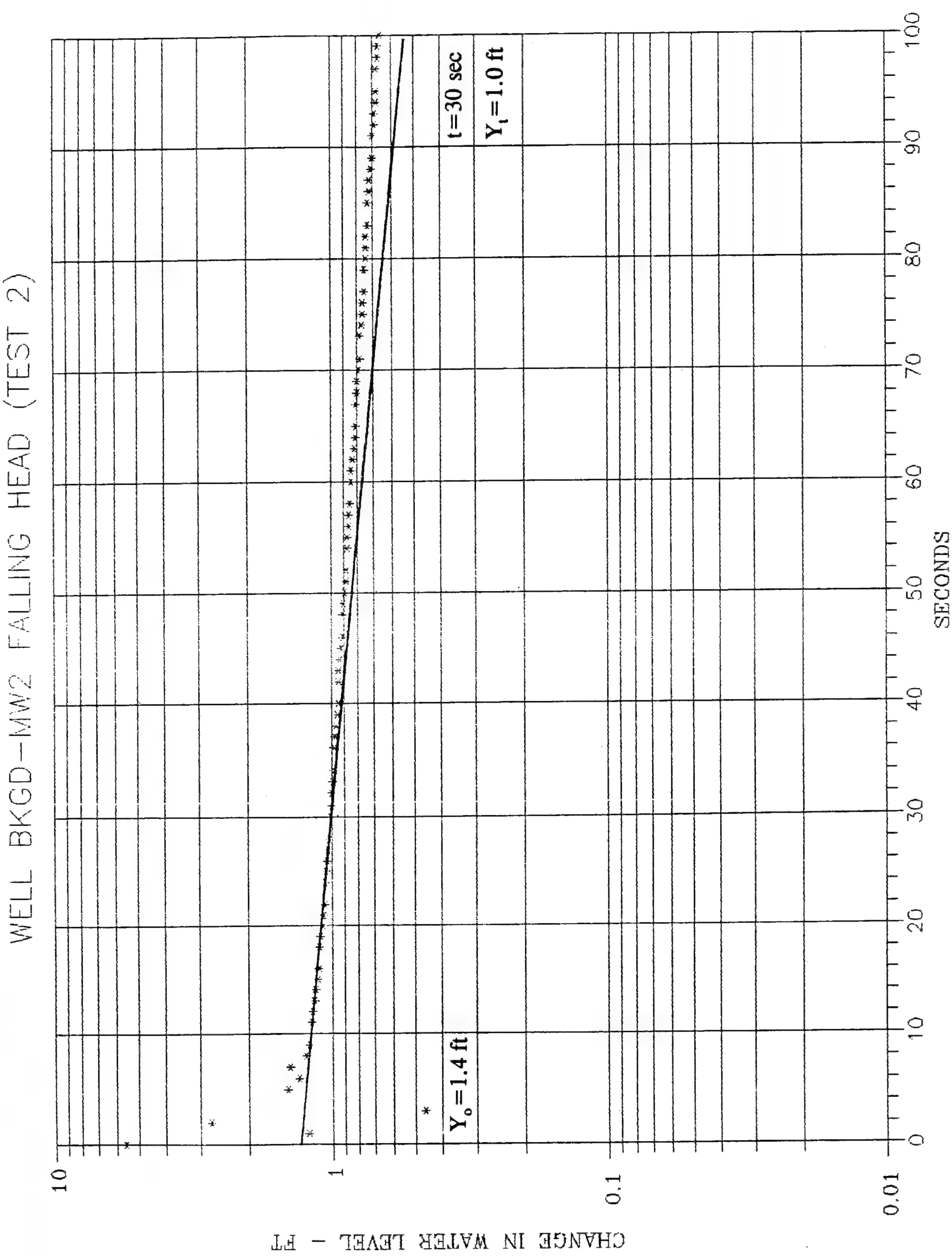
WELL BKGD-MW2 RISING HEAD

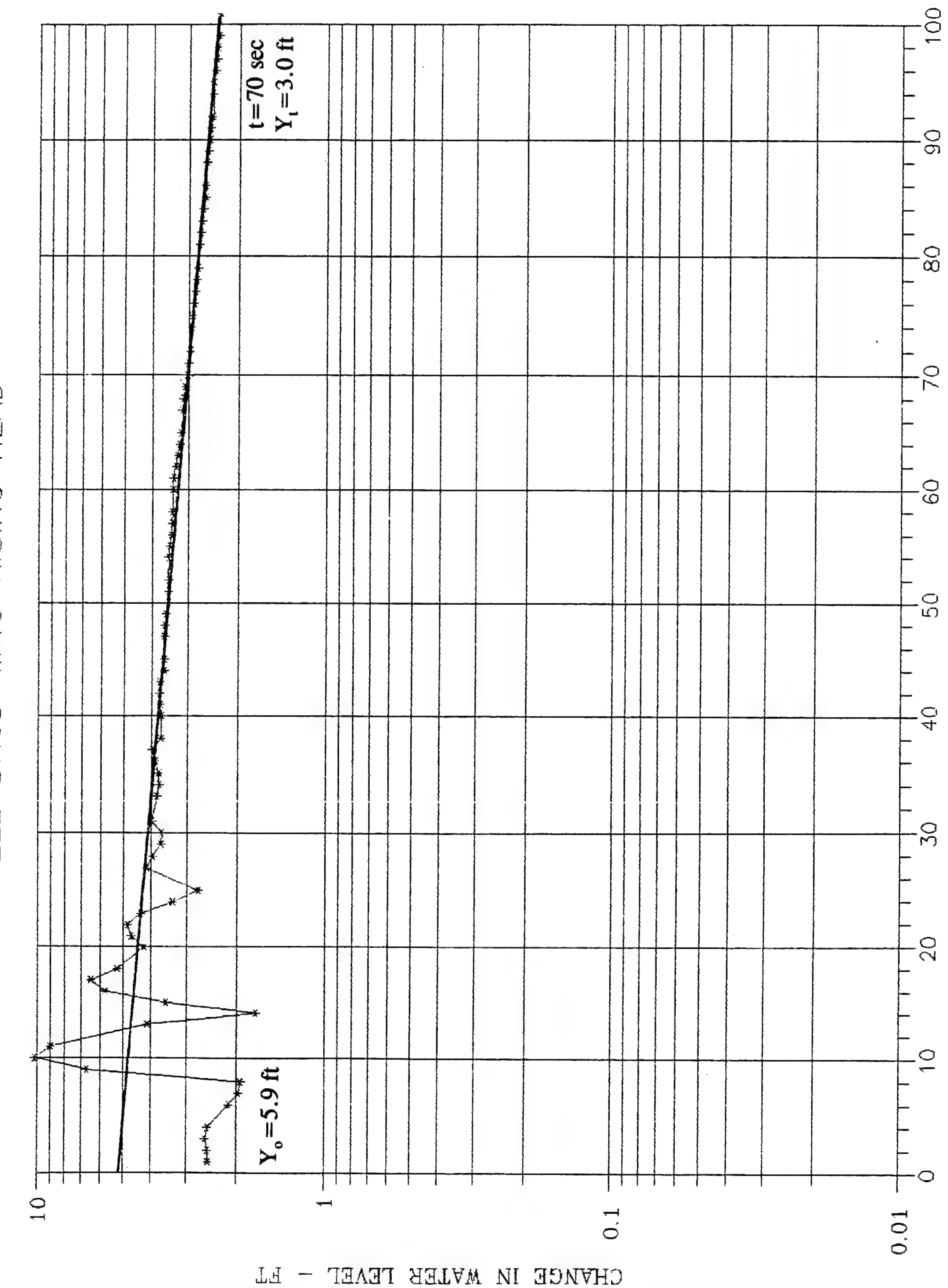



WELL BKGD-MW2 FALLING HEAD
t=20 sec
Y_t=1.5 ft
Y_o=1.7 ft
CHANGE IN WATER LEVEL - FT
SECONDS
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100

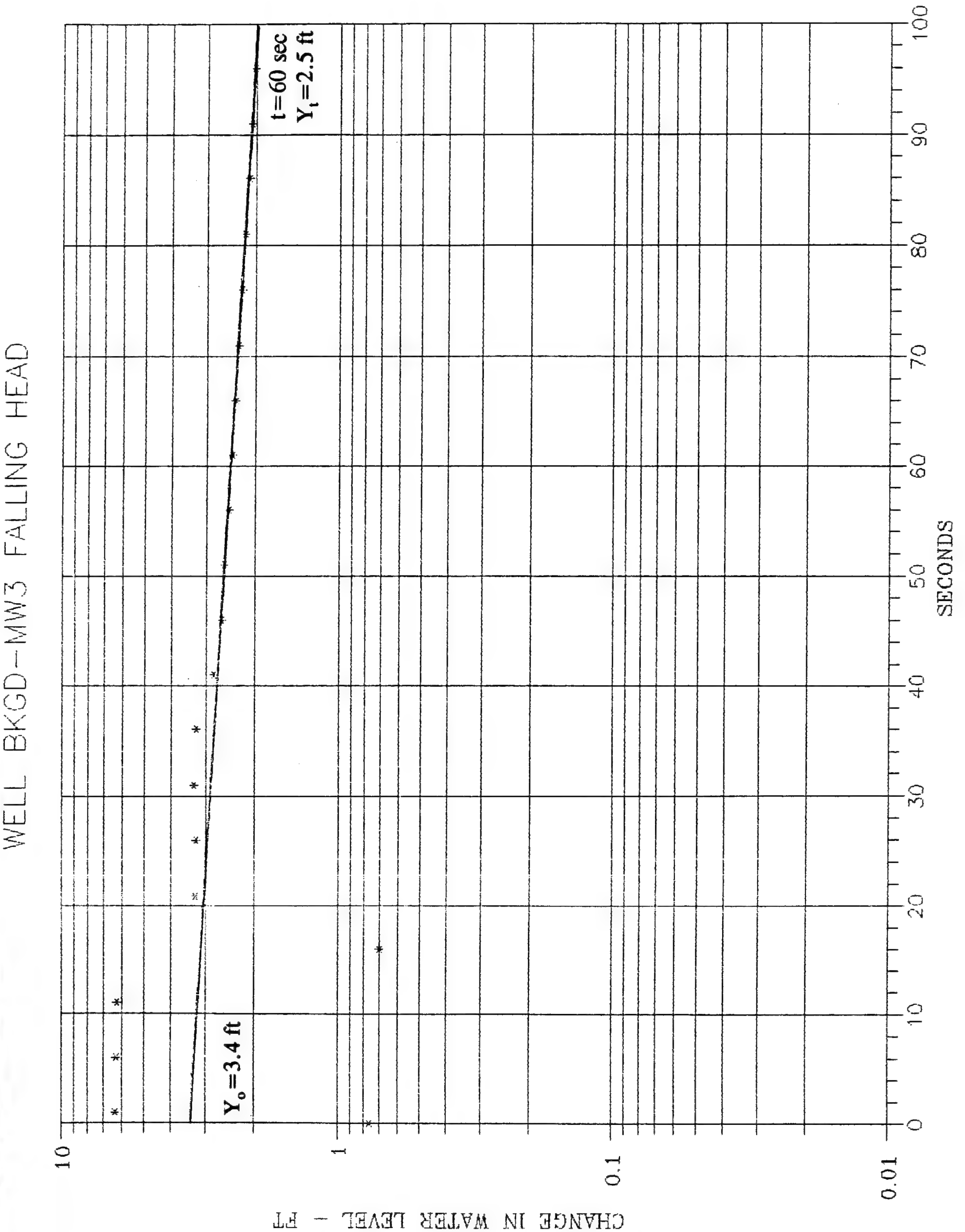
WELL BKGD–MW2 RISING HEAD (TEST 2)

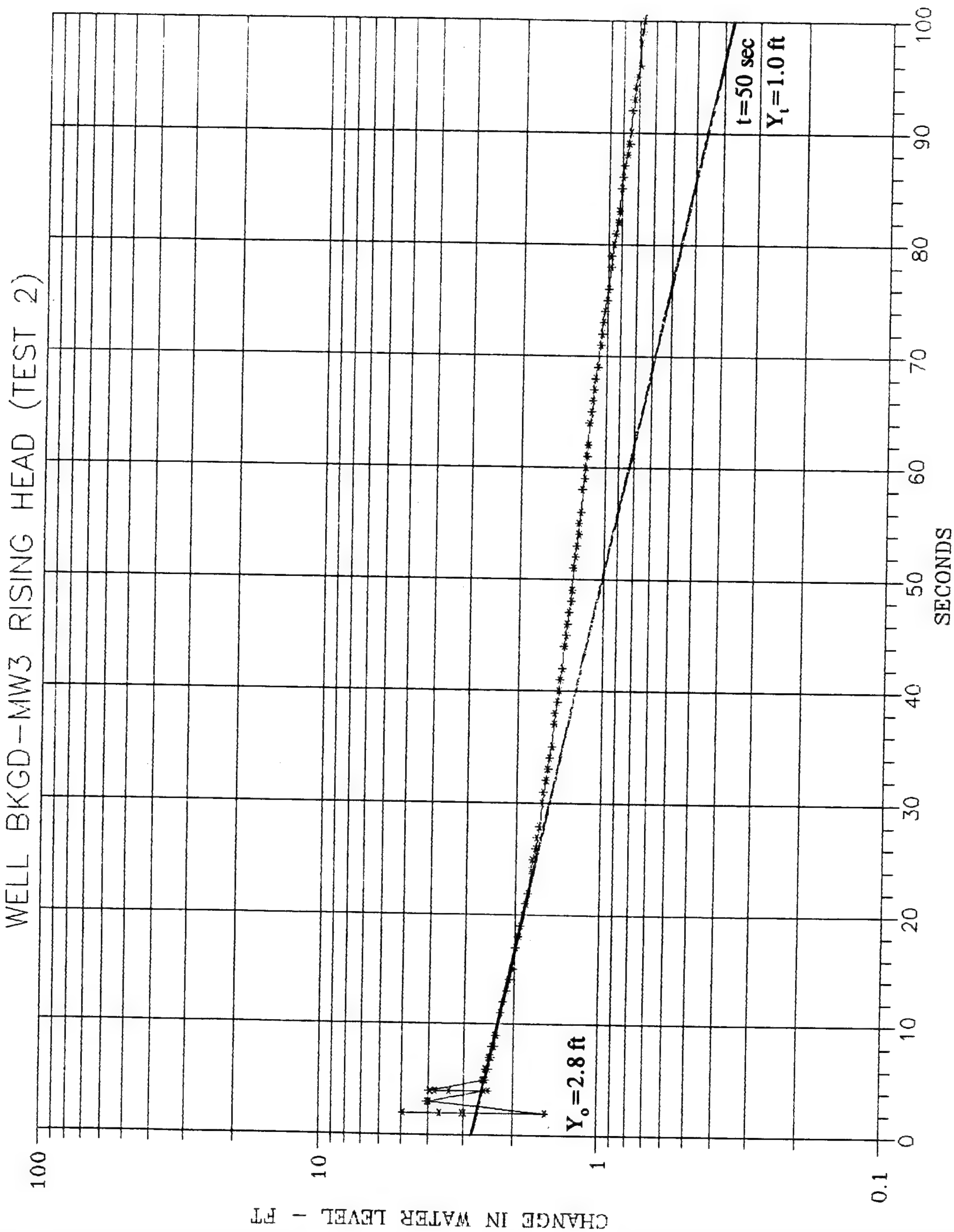


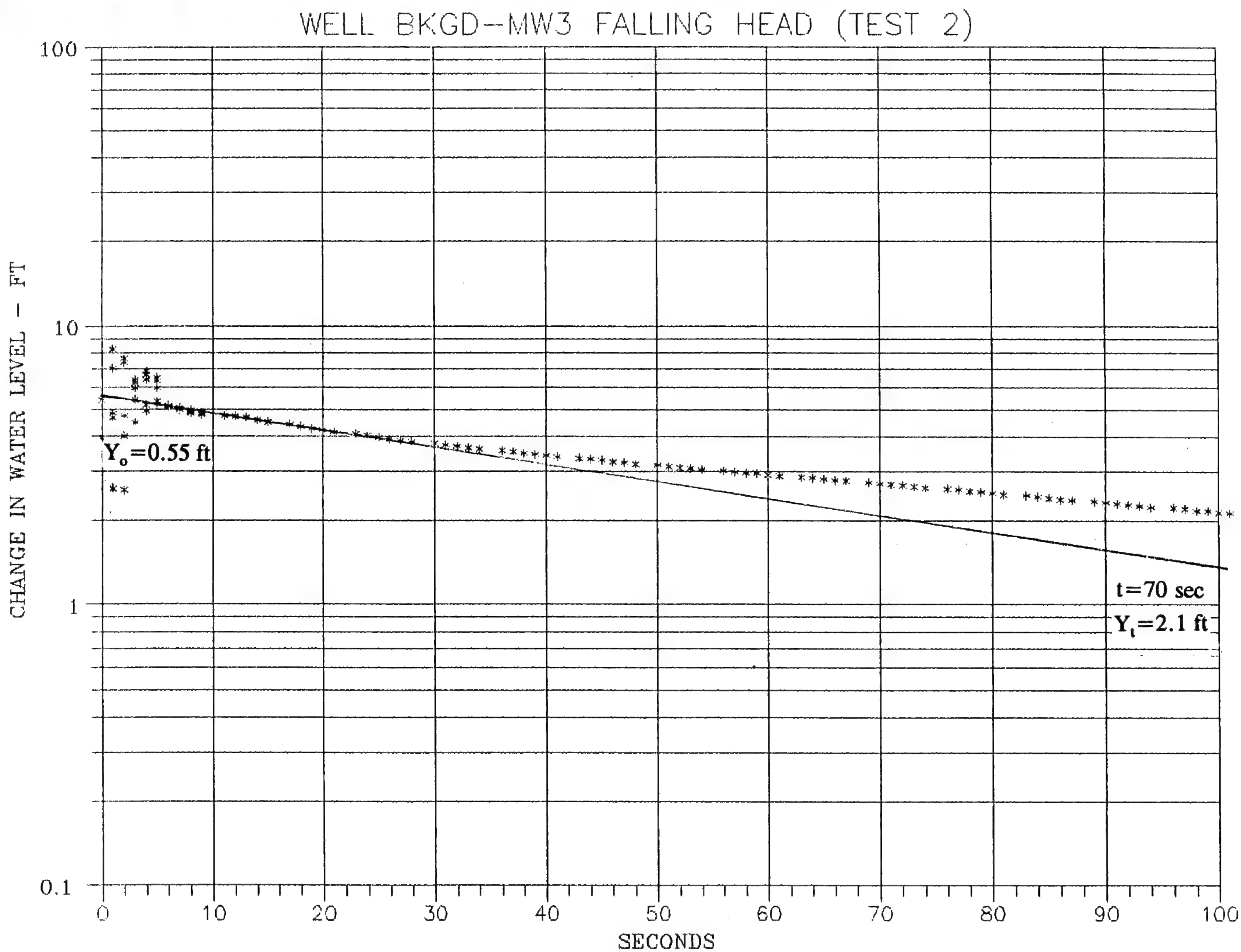

WELL BKGD-MW2 FALLING HEAD (TEST 2)
t=30 sec
Y_t=1.0 ft
Y_o=1.4 ft
SECONDS
CHANGE IN WATER LEVEL - FT
10
1
0.1
0.01
0
10
20
30
40
50
60
70
80
90
100



t=70 sec
Y_t=3.0 ft
Y_o=5.9 ft
CHANGE IN WATER LEVEL – FT
10
1
0.1
0.01
SECONDS
0
10
20
30
40
50
60
70
80
90
100


WELL BKGD-MW3 FALLING HEAD
t=60 sec
Y_t=2.5 ft
Y_o=3.4 ft
CHANGE IN WATER LEVEL - FT
10
1
0.1
0.01
SECONDS
0
10
20
30
40
50
60
70
80
90
100


WELL BKGD-MW3 RISING HEAD (TEST 2)
Y_o=2.8 ft
t=50 sec
Y_t=1.0 ft
100
10
1
0.1
CHANGE IN WATER LEVEL - FT
0
10
20
30
40
50
60
70
80
90
100
SECONDS


WELL BKGD-MW3 FALLING HEAD (TEST 2)
CHANGE IN WATER LEVEL - FT
SECONDS
Y_o=0.55 ft
t=70 sec
Y_t=2.1 ft
100
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100

Attachment 2
Bouwer and Rice Slug Test Methodology

A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells

HERMAN BOUWER AND R. C. RICE

U.S. Water Conservation Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Phoenix, Arizona 85040

A procedure is presented for calculating the hydraulic conductivity of an aquifer near a well from the rate of rise of the water level in the well after a certain volume of water is suddenly removed. The calculation is based on the Thiem equation of steady state flow to a well. The effective radius R_e over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated was evaluated with a resistance network analog for a wide range of system geometries. An empirical equation relating R_e to the geometry of the well and aquifer was derived. The technique is applicable to completely or partially penetrating wells in unconfined aquifers. It can also be used for confined aquifers that receive water from the upper confining layer. The method's results are compatible with those obtained by other techniques for overlapping geometries.

With the slug test the hydraulic conductivity or transmissibility of an aquifer is determined from the rate of rise of the water level in a well after a certain volume or 'slug' of water is suddenly removed from the well. The slug test is simpler and quicker than the Theis pumping test because observation wells and pumping the well are not needed. With the slug test the portion of the aquifer 'sampled' for hydraulic conductivity is smaller than that for the pumping test even though with the latter, most of the head loss also occurs within a relatively small distance of the pumped well and the resulting transmissibility primarily reflects the aquifer conditions near the pumped well.

Essentially instantaneous lowering of the water level in a well can be achieved by quickly removing water with a bailer or by partially or completely submerging an object in the water, letting the water level reach equilibrium, and then quickly removing the object. If the aquifer is very permeable, the water level in the well may rise very rapidly. Such rapid rises can be measured with sensitive pressure transducers and fast-response strip chart recorders or x-y plotters. Also it may be possible to isolate portions of the perforated or screened section of the well with special packers for the slug test. This not only reduces the inflow and hence the rate of rise of the water level in the well, but it also makes it possible to determine the vertical distribution of the hydraulic conductivity. Special packer techniques may have to be developed to obtain a good seal, especially for rough casings or perforations. Effective sealing may be achieved with relatively long sections of inflatable stoppers or tubing. The use of long sections of these materials would also reduce leakage flow from the rest of the well to the isolated section between packers. This flow can occur through gravel envelopes or other permeable zones surrounding the casing. Sections of inflatable tubing may have to be long enough to block off the entire part of the well not used for the slug test. High inflation pressures should be used to minimize volume changes in the tubing due to changing water pressures in the isolated section when the head is lowered.

So far, solutions for the slug test have been developed only for completely penetrating wells in confined aquifers. *Cooper et al.* [1967] derived an equation for the rise or fall of the water level in a well after sudden lowering or raising, respectively. Their equation was based on nonsteady flow to a pumped, completely penetrating well, and the solution was expressed as a series of 'type curves' against which observed rates of water level rises were matched. Values for the transmissibility and storage coefficient were then evaluated from the curve parameter and horizontal-scale position of the type curve showing the best fit with the experimental data. *Skibitzke* [1958] developed an equation for calculating transmissibility from the recovery of the water level in a well that was repeatedly bailed. The technique is limited to wells in confined aquifers with sufficiently shallow water levels to permit short time intervals between bailing cycles [*Lohman,* 1972].

To use the slug test for partially penetrating or partially perforated wells in confined or unconfined aquifers, some solutions developed for the auger hole and piezometer techniques to measure soil hydraulic conductivity [*Bouwer and Jackson,* 1974] may be employed. However, the geometry of most groundwater wells is outside the range in geometry covered by the existing equations or tables for the auger hole or piezometer methods. For this reason, theory and equations are presented in this paper for slug tests on partially or completely penetrating wells in unconfined aquifers for a wide range of geometry conditions. The wells may be partially or completely perforated, screened, or otherwise open along their periphery. While the solutions are developed for unconfined aquifers, they may also be used for slug tests on wells in confined aquifers if water enters the aquifer from the upper confining layer through compression or leakage.

THEORY

Geometry and symbols of a well in an unconfined aquifer are shown in Figure 1. For the slug test the water level in the well is suddenly lowered, and the rate of rise of the water level is measured. The flow into the well at a particular value of y can be calculated by modifying the Thiem equation to

$$Q = 2\pi KL \frac{y}{\ln (R_e/r_w)} \tag{1}$$

where Q is the flow into the well (length^3/time), K is the hydraulic conductivity of the aquifer (length/time), L is the height of the portion of well through which water enters (height of screen or perforated zone or of uncased portion of well), y is the vertical distance between water level in well and equilibrium water table in aquifer, R_e is the effective radius over which y is dissipated, and r_w is the horizontal distance

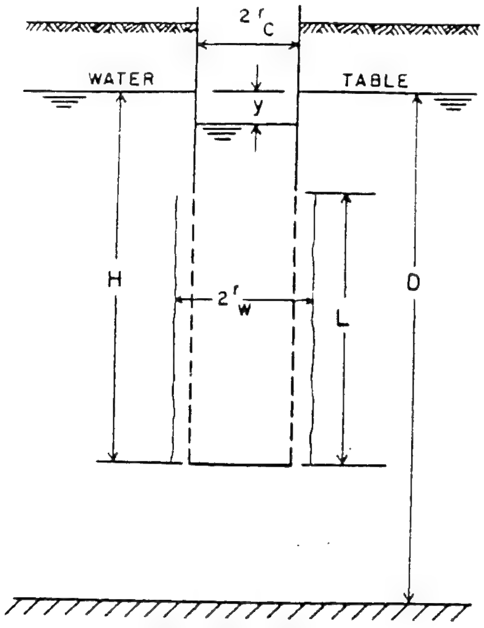


Fig. 1. Geometry and symbols of a partially penetrating, partially perforated well in unconfined aquifer with gravel pack or developed zone around perforated section.

from well center to original aquifer (well radius or radius of casing plus thickness of gravel envelope or developed zone).

The terms L, y, R_e, and r_w are all expressed in units of length. The effective radius R_e is the equivalent radial distance over which the head loss y is dissipated in the flow system. The value of R_e depends on the geometry of the flow system, and it was determined for different values of H, L, D, and r_w (Figure 1) with a resistance network analog, as will be discussed in the next section. Equation (1) is based on the assumptions that (1) drawdown of the water table around the well is negligible, (2) flow above the water table (in the capillary fringe) can be ignored, (3) head losses as water enters the well (well losses) are negligible, and (4) the aquifer is homogeneous and isotropic. These are the usual assumptions in the development of equations for pumped hole techniques [*Bouwer and Jackson*, 1974, and references therein].

The value of r_w in (1) represents the radial distance between the undisturbed aquifer and the well center. Thus r_w should include gravel envelopes or 'developed' zones if they are much more permeable than the aquifer itself (Figure 1).

The rate of rise, dy/dt, of the water level in the well after suddenly removing a slug of water can be related to the inflow Q by the equation

$$dy/dt = -Q/\pi r_c^2 \tag{2}$$

where πr_c^2 is the cross-sectional area of the well where the water level is rising. The minus sign in (2) is introduced because y decreases as t increases.

The term r_c is the inside radius of the casing if the water level is above the perforated or otherwise open portion of the well. If the water level is rising in the perforated section of the well, allowance should be made for the porosity outside the well casing if the hydraulic conductivity of the gravel envelope or developed zone is much higher than that of the aquifer. In that case the (open) porosity in the permeable zone must be included in the cross-sectional area of the well. For example, if the radius of the perforated casing is 20 cm and the casing is surrounded by a 10-cm permeable gravel envelope with a porosity of 30%, r_c should be taken as $[20^2 + 0.30(30^2 - 20^2)]^{1/2} = 23.5$ cm to obtain the cross-sectional area of the well that relates Q to dy/dt. The value of r_w for this well section is 30 cm.

Combining (1) and (2) yields

$$\frac{1}{y}\,dy = -\frac{2KL}{r_c^2 \ln (R_e/r_w)}\,dt \tag{3}$$

which can be integrated to

$$\ln y = -\frac{2KLt}{r_c^2 \ln (R_e/r_w)} + \text{constant} \tag{4}$$

Applying this equation between limits y_0 at $t = 0$ and y_t at t and solving for K yield

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{5}$$

This equation enables K to be calculated from the rise of the water level in the well after suddenly removing a slug of water from the well. Since K, r_c, r_w, R_e, and L in (5) are constants, $(1/t) \ln y_0/y_t$ must also be constant. Thus field data should yield a straight line when they are plotted as $\ln y_t$ versus t. The term $(1/t) \ln y_0/y_t$ in (5) is then obtained from the best-fitting straight line in a plot of $\ln y$ versus t (see the example). The value of $\ln R_e/r_w$ is dependent on H, D, L, and r_w and can be evaluated from the analog results presented in the next section. The transmissibility T of the aquifer is calculated by multiplying (5) by the thickness D of the aquifer or

$$T = \frac{Dr_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{6}$$

This equation is based on the assumption that the aquifer is uniform with depth.

Equations (5) and (6) are dimensionally correct. Thus K and T are expressed in the same units as the length and time parameters in the equations.

Evaluation of R_e

Values of R_e, expressed as $\ln R_e/r_w$, were determined with an electrical resistance network analog for different values of r_w, L, H, and D (Figure 1), using the same assumptions as those for (1). An axisymmetric sector of 1 rad was simulated by a network of electrical resistors. The vertical distance between the nodes was constant, but the radial distance between nodes increased with increasing distance from the center line (Figure 2). This yielded a network with the highest node density near the well, where the head loss was greatest, and a decreasing node density toward the outer reaches of the system. For a more detailed discussion of graded networks for representing axisymmetric flow systems, see *Liebmann* [1950] and *Bouwer* [1960].

The radial extent of the medium represented on the analog was more than 60,000 times the largest r_w value used in the analyses. Thus the radial extent of the analog system was essentially infinite, as evidenced by the fact that a reduction in radial extent by several nodes did not have a measurable effect on the observed value of R_e.

The value of R_e for an infinitely deep aquifer ($D = \infty$) was determined by simulating an impermeable and then an infinitely permeable layer at a certain value of D. If this value of D is taken to be sufficiently large, the flow in the system when the layer at D is taken as being impermeable is only slightly

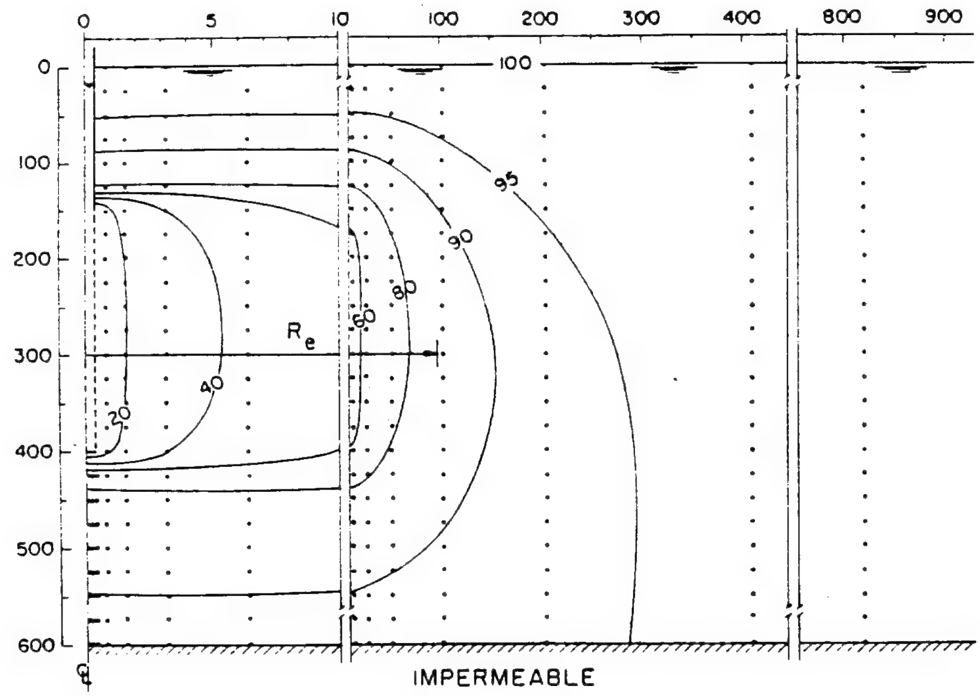


Fig. 2. Node arrangement (dots) for resistance network analog and potential distribution (indicated as percentages on equipotentials) for system with $L/r_w = 625$, $H/r_w = 1000$, and $D/r_w = 1500$. The numbers on the left and at the top of the figure are arbitrary length units (note breaks in horizontal scale).

less than the flow when the layer is taken as being infinitely permeable. The average of the two flows can then be taken as a good estimate of the flow that would occur if the aquifer were represented on the analog as being uniform to infinite depth [*Bouwer*, 1967]. This average flow was used to calculate R_e for $D = \infty$.

The analog analyses were performed by simulating a system with certain values of r_w, H, and D. The electrical current entering the 'well' was then measured for different values of L, ranging from near H to near 0. This was repeated for other values of r_w, H, and D. The condition where $L = H$ could not be simulated on the analog because it would mean a short between the water table as the source and the well as the sink. The electrical current flow in the analog was converted to volume per day, and $\ln R_e/r_w$ was evaluated with (1) for each combination of r_w, H, L, and D used in the analog.

For a given geometry described by r_w, H, and D, the current flow Q_t into the simulated well varied essentially linearly with L and could be described by the equation

$$Q_t = mL + n \qquad (7)$$

Because of the linearity between Q_t and L the results of the analyses could be extrapolated to the condition $L = H$. The values of m in (7) appeared to vary inversely with $\ln H/r_w$. The values of n varied approximately linearly with $\ln [(D - H)/r_w]$, the slope A and intercept B in these relations being a function of L/r_w. This enabled the derivation of the following empirical equation relating $\ln R_e/r_w$ to the geometry of the system:

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (H/r_w)} + \frac{A + B \ln [(D - H)/r_w]}{L/r_w}\right]^{-1} \qquad (8)$$

In this equation, A and B are dimensionless coefficients that are functions of L/r_w, as shown in Figure 3. If $D >> H$, an increase in D has no measurable effect on $\ln R_e/r_w$. The analog results indicated that the effective upper limit of $\ln [(D - H)/r_w]$ is 6. Thus if D is considered infinity or $(D - H)/r_w$ is so large that $\ln [(D - H)/r_w]$ is greater than 6, a value of 6 should still be used for the term $\ln [(D - H)/r_w]$ in (8).

If $D = H$, the term $\ln [(D - H)/r_w]$ in (8) cannot be used. The analog results indicated that for this condition, which is the case of a fully penetrating well, (8) should be modified to

$$\ln R_e/r_w = \left(\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w}\right)^{-1} \qquad (9)$$

where C is a dimensionless parameter that is a function of L/r_w as shown in Figure 3.

Equations (8) and (9) yield values of $\ln R_e/r_w$ that are within 10% of the actual value as evaluated by analog if $L > 0.4H$ and within 25% if $L << H$ (for example, $L = 0.1H$).

The analog analyses were performed for wells that were closed at the bottom. Occasionally, however, wells with open bottoms were also simulated. The flow through the bottom appeared to be negligible for all values of r_w and L used in the analyses. If L is not much greater than r_w (for example, L/r_w << 4), the system geometry approaches that of a piezometer cavity [*Bouwer and Jackson*, 1974], in which case the bottom flow can be significant. Equations (8) and (9) can also be used to evaluate $\ln R_e/r_w$ if a portion of the perforated or otherwise open part of the well is isolated with packers for the slug test.

Equipotentials for the flow system around a partially penetrating, partially perforated well in an unconfined aquifer after lowering the water level in the well are shown in Figure 2. The numbers along the symmetry axis and the water table represent arbitrary length units. The numbers on the equipotentials indicate the potential as a percentage of the total head difference between the water table (100%) and the open portion of the well (0%) shown as a dashed line.

The value of R_e for the case in Figure 2 is 96.7 length units. As shown in the figure, this corresponds approximately to the

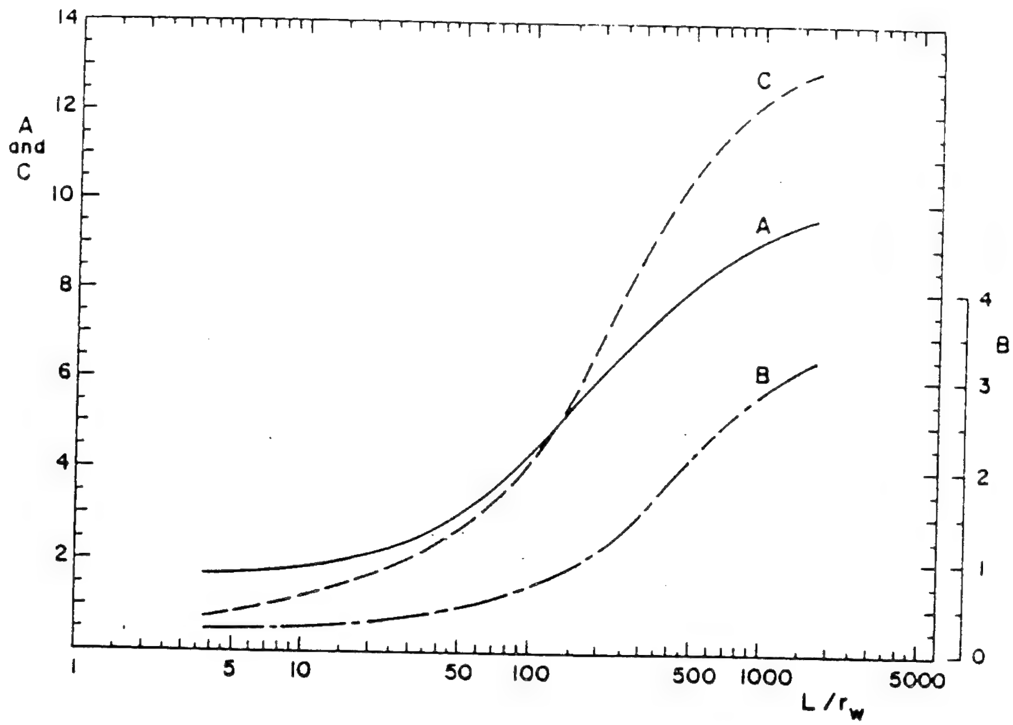


Fig. 3. Curves relating coefficients A, B, and C to L/r_w.

85% equipotential when R_e is laterally extended from the center of the open portion of the well. Thus most of the head loss in the flow system occurs in a cylinder with radius R_e, which is indicative of the horizontal extent of the portion of the aquifer sampled for K or T. The vertical extent is somewhat greater than L, as indicated by, for example, the 80% equipotential in Figure 2.

To estimate the rate of rise of the water level in a well after it is suddenly lowered, (5) can be written as

$$t = \frac{r_c^2}{2KL} \ln \frac{R_e}{r_w} \ln \frac{y_0}{y_t} \qquad (10)$$

By taking $y_t = 0.9y_0$, (10) reduces to

$$t_{90\%} = 0.0527 \frac{r_c^2}{KL} \ln \frac{R_e}{r_w} \qquad (11)$$

where $t_{90\%}$ is the time that it takes for the water level to rise 90% of the distance to the equilibrium level. By assuming a permeable aquifer with K = 30 m/day, a well with r_c = 0.2 m and L = 10 m, and $\ln(R_e/r_w) = 3$, (11) yields $t_{90\%}$ = 1.82 s. Thus if y_0 is taken as 30 cm, it takes 1.8 s for the water level to rise 27 cm, another 1.8 s for the next 2.7 cm (90% of the remaining 3 cm), and another 1.8 s for the next 0.27 cm, or a total of 5.4 s for a rise of 29.97 cm. Measurement of this fast rise requires a sensitive and accurate transducer and a fast-response recorder. The rate of rise can be reduced by allowing groundwater to enter through only a portion of the open section of the well, as can be accomplished with packers.

For a moderately permeable aquifer with, for example, K = 1 m/day, a well with r_c = 0.1 m and L = 20 m, and $\ln(R_e/r_w)$ = 5, (11) yields t = 11.4 s. In this case, it would take the water level 22.8 s to rise from 30 cm to 0.3 cm below static level.

Example

A slug test was performed on a cased well in the alluvial deposits of the Salt River bed west of Phoenix, Arizona. The well, known as the east well, is located about 20 m east of six rapid infiltration basins for groundwater recharge with sewage effluent [*Bouwer*, 1970]. The static water table was at a depth of 3m, D = 80 m, H = 5.5 m, L = 4.56 m, r_c = 0.076 m, and r_w was taken as 0.12 m to allow for development of the aquifer around the perforated portion of the casing. A Statham PM131TC pressure transducer was suspended about 1 m below the static water level in the well (when trade names and company names are included, they are for the convenience of the reader and do not imply preferential endorsement of a particular product or company over others by the U.S. Department of Agriculture). A solid cylinder with a volume equivalent to a 0.32-m change in water level in the well was also placed below the water level. When the water level had returned to equilibrium, the cylinder was quickly removed. The transducer output, recorded on a Sargent millivolt recorder, yielded the y-t relationship shown in Figure 4 with y plotted on a logarithmic scale. The straight-line portion is the valid part of the readings. The actual y_0 value of 0.29 m indicated by the straight line is close to the theoretical value of 0.32 m calculated from the displacement of the submerged cylinder.

Extending the straight line in Figure 4 shows that for the arbitrarily selected t value of 20 s, y = 0.0025 m. Thus $(1/t)\ln y_0/y_t$ = 0.238 s^{-1}. The value of L/r_w = 38, for which Figure 3 yields A = 2.6 and B = 0.42. Substituting these values into (8) and using the maximum value of 6 for $\ln[(D - H)/r_w]$ (since $\ln[(D - H)/r_w]$ for the well exceeds 6) yield $\ln(R_e/r_w)$ = 2.37. Equation (5) then gives K = 0.00036 m/s = 31 m/day. This value agrees with K values of 10 and 53 m/day obtained previously with the tube method on two nearby observation wells [*Bouwer*, 1970]. These K values were essentially point measurements on the aquifer immediately around the well bottoms, which were at depths of 9.1 and 6.1 m, respectively.

Comparisons

Piezometer method. The geometry to which (8) and (9) and the coefficients in Figure 3 apply overlaps the geometry of the

ıezometer method at the lower values of L/r_w. With the ıezometer method a cavity is augered out in the soil below a ıezometer tube. The water level in the tube is abruptly owered, and K of the soil around the cavity is calculated from he rate of rise of the water level in the tube [*Bouwer and ackson*, 1974]. The equation for K is

$$K = \frac{\pi r_w^2}{A_Y} \frac{1}{t} \ln \frac{y_0}{y_t} \tag{12}$$

·here A_Y is a geometry factor with dimension of length. Values of A_Y were evaluated with an electrolytic tank analog by *'oungs* [1968], whose results were expressed in tabular form as $_Y/r_w$ for different values of L/r_w (ranging between 0 and 8), $H - L)/r_w$, and $(D - H)/r_w$.

Taking a hypothetical case where $L/r_w = 8$, $H/r_w = 12$, and $)/r_w = 16$, K calculated with (5) is 18% below K calculated ·ith (12). This is more than the 10% error normally expected ·ith (8) and (9) for the L/H value of 0.67 in this case. The ırger discrepancy may be due to the difference in methodlogy, or to the fact that the L/r_w value is close to the lower mit of the range covered on the resistance network analog.

An approximate equation for calculating K with the pieometer method was presented by *Hvorslev* [1951]. The equaon, which is based on the assumptions of an ellipsoidal cavity r well screen and infinite vertical extent (upward and down·ard) of the flow system, contains a term $[1 + (L/2r_w)^2]^{1/2}$. 'or most well-slug-test geometries, $L/2r_w$ will be sufficiently ırge to permit replacement of this term by $L/2r_w$. In that case, owever, Hvorslev's equation for Q yields $R_e = L$, which is not ·ue. In reality, R_e is considerably less than L. For example, if $= 40$ m, $r_w = 0.4$ m, $H = 80$ m, and $D = \infty$, (8) shows that $R_e = 11.9$ m, which is much less than the value of 40 m ıdicated by Hvorslev's equation. However, since the calcuıtion of K is based on $\ln (R_e/r_w)$ as shown by (5), the error in ' is less than the error in R_e (i.e., 36 and 236%, respectively, in ıis case).

If, for the above example, the top of the well screen or cavity ad been taken at the same level as the water table ($H = 40$ m), R_e would have been 8.6 m and Hvorslev's equation would have ıelded a K value that is 50% higher than K given by (5). The ırger error is probably due to Hvorslev's assumption of innite vertical (upward) extent of the flow system, which is not ıet when the cavity is immediately below the water table. Jsing Hvorslev's equation for cavities immediately below a onfining layer would increase the error to 73%, but this, of ourse, is due to the fact that a water table is not a solid oundary. Hvorslev's equation for the confining layer case can e shown to yield $R_e = 2L$.

Auger hole method. The analog analyses for (8) and (9) and igure 3 were performed for $L < H$, because short circuiting ·etween the water table and the well prevented simulation of ıe case where $L = H$. If the analog results are extrapolated to $= H$, however, the geometry of the system in Figure 1 ecomes similar to that of the auger hole technique, for which number of equations and graphs have been developed to alculate K from the rise of the water level in the well [*Bouwer nd Jackson*, 1974]. *Boast and Kirkham* [1971], for example, eveloped the equation

$$K = C_{HK} \frac{\Delta y}{\Delta t} \tag{13}$$

·here C_{HK} was determined mathematically and expressed in abular form for various values of L/r_w, $(D - H)/r_w$, and $_w/H$. Since the rate of rise of the water level in the hole after the removal of a slug of water decreases with decreasing y, $\Delta y/\Delta t$ is not a constant and the value of K obtained with this procedure depends on the magnitude of Δy used in the field measurements. The general rule is that Δy should be relatively small.

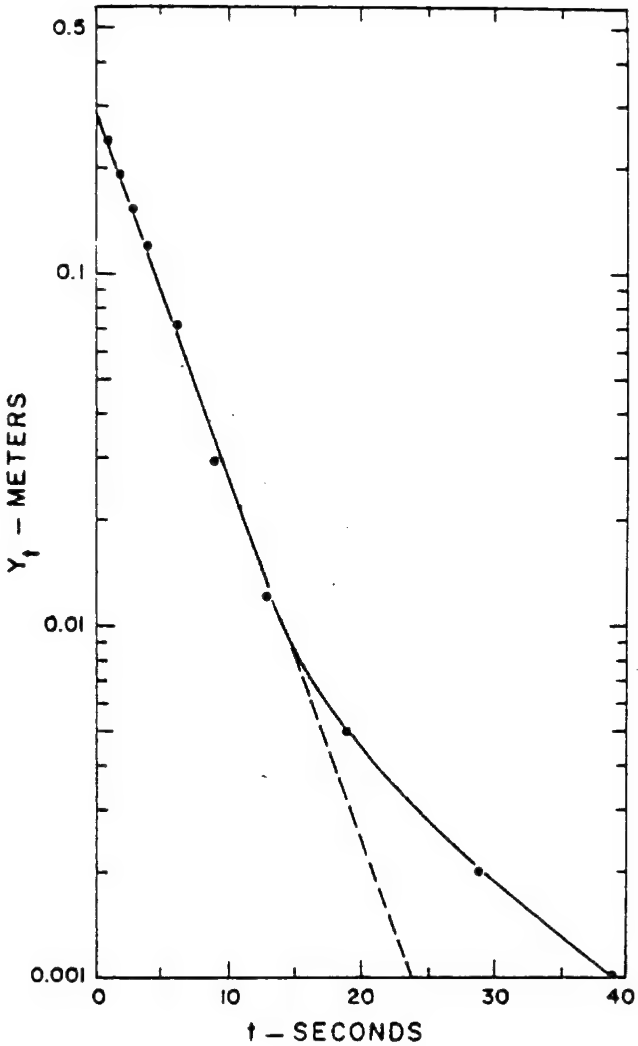


Fig. 4. Plot of y versus t for slug test on east well.

Taking a hypothetical case where $y_0 = 2.5$ m, $y_t = 2.4$ m, $\Delta t = 10$ s, $L = H = 5$ m, $D = 6$ m, and $r_w = 0.1$ m, (5) yields a K value that is 36% lower than K calculated with (13). However, if y_t is taken as 0.5 m, which should give $\Delta t = 394$ s according to the theory that $(1/t) \ln y_0/y_t$ is constant, the K value yielded by (5) is 26% higher than K obtained with (13). If y_t is taken as 0.9 m, (5) and (13) give identical results.

Slug test on wells in confined aquifers. The confined aquifer for which the slug test by *Cooper et al.* [1967] was developed is an aquifer with an internal water source, for example, recharge through aquitards or compression of confining layers or other material. This situation is similar to that of the unconfined aquifer presented in this paper because the water table is considered horizontal, like the upper boundary of a confined aquifer, and the water table is a plane source. Thus K or T calculated with (5) or (6) should be of the same order as K calculated with the procedure of *Cooper et al.* [1967], which involves plotting the rise of the water level in the well and finding the best fit on a family of type curves. *Cooper et al.* [1967] presented an example of the calculation of T for a well

with $r_c = r_w = 0.076$ m and $L = 98$ m. The resulting value of T was 45.8 m²/day. Values of D and H for this well were not given. However, since the well was 122 m deep and completely penetrating (at least theoretically), D and H must have been between 98 and 122 m. Assuming that both D and H were 100 m, (6) yields $T = 62.8$ m²/day, which is compatible with T obtained by Cooper et al.

CONCLUSIONS

The hydraulic conductivity of an aquifer near a well can be calculated from the rise of the water level in the well after a slug of water is suddenly removed. The calculation is based on the Thiem equation, using an effective radius R_e for the distance over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated. Values of R_e were evaluated by electrical resistance network analog. An empirical equation was then developed to relate R_e to the geometry of the system. This equation is accurate to within 10–25%, depending on how much of the well below the water table is perforated or otherwise open. The technique is applicable to partially or completely penetrating wells in unconfined aquifers. It can also be used to estimate the hydraulic conductivity of confined aquifers that receive water from the upper confining layer through recharge or compression.

The vertical distance between the rising water level in the well and the equilibrium water table in the aquifer must yield a straight line when it is plotted on a logarithmic scale against time. This can be used to check the validity of field measurements and to obtain the best-fitting line for calculating the hydraulic conductivity. Permeable aquifers produce rapidly rising water levels that can be measured with fast-response pressure transducers and strip chart recorders or x-y plotters. The portion of the aquifer sampled for hydraulic conductivity with the slug test is approximately a cylinder with radius R_e and a height somewhat larger than the perforated or otherwise open section of the well.

Hydraulic conductivity values obtained with the proposed slug test are compatible with those yielded by the auger hole and piezometer techniques where the geometries of the systems overlap, and by a slug test for completely penetrating wells in confined aquifers.

REFERENCES

Boast, C. W., and D. Kirkham, Auger hole seepage theory, *Soil Sci. Soc. Amer. Proc.*, *35*(3), 365–374, 1971.

Bouwer, H., A study of final infiltration rates from ring infiltrometers and irrigation furrows with a resistance network analog, in *7th International Congress of Soil Science*, vol. 1, pp. 448–456, International Society of Soil Science, Madison, Wis., 1960.

Bouwer, H., Analyzing subsurface flow systems with electric analogs, *Water Resour. Res.*, *3*(3), 897–907, 1967.

Bouwer, H., Ground water recharge design for renovating waste water, *J. Sanit. Eng. Div. Amer. Soc. Civil Eng.*, *96*(SA1), 59–74, 1970.

Bouwer, H., and R. D. Jackson, Determining soil properties, in *Drainage for Agriculture, ASA Monogr. 17*, chap. 23, sect. 10, edited by J. van Schilfgaarde, pp. 611–672, American Society of Agronomy, Madison, Wis., 1974.

Cooper, H. H., Jr., J. D. Bredehoeft, and I. S. Papadopulos, Response of a finite diameter well to an instantaneous charge of water, *Water Resour. Res.*, *3*, 263–269, 1967.

Hvorslev, J. M., Time lag and soil permeability in ground-water observations, *Bull. 36*, 50 pp., U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951.

Liebmann, G., Solution of partial differential equations with a resistance network analogue, *Brit. J. Appl. Phys.*, *1*, 92–103, 1950.

Lohman, S. W., Groundwater hydraulics, *U.S. Geol. Surv. Prof. Pap. 708*, 70 pp., 1972.

Skibitzke, H. E., An equation for potential distribution about a well being bailed, open file report, U.S. Geol. Surv., Washington, D. C., 1958.

Youngs, E. G., Shape factors for Kirkham's piezometer method for determining the hydraulic conductivity of soil *in situ* for soils overlying an impermeable floor or infinitely permeable stratum, *Soil Sci.*, *106*(3), 235–237, 1968.

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accepted January 23, 1976.)

Appendix I
Special-Status Species Expected to Occur in the Vicinity of Gulfport Field Training Site

User: Janet F. Ledbetter-Ferrill
Re: Environmental Risk Assement: Jackson, MS area

CODES

Legal Status	LE	Listed endangered
	LT	Listed threatened
Non-legal Status	PE	Proposed endangered
	PT	Proposed threatened
	PC	Proposed special concern
	PR	Proposed rare
	PP	Proposed peripheral

Federal Candidate Species

C1 Category 1 - sufficient information exists to propose listing
C2 Category 2 - information insufficient to list; survey needed
3C Former candidate species but proven to be more abundant and/or less threatened than originally believed

Global Ranks

G1 - Critically imperiled globally because of extreme rarity (very few individuals or acres) or because of some factor(s) making it especially vulnerable to extinction
G2 - Imperiled globally because of rarity or because of some factor(s) making it especially vulnerable to extinction
G3 - Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range
G4 - Apparently secure globally though possibly rare in some parts of the range, especially at the periphery
G5 - Demonstrably secure globally though possibly rare in some parts of the range, especially at the periphery
GH - Of historical occurrence throughout the range with the possibility of being rediscovered
GU - Possibly in peril range wide but status uncertain
GX - Presumed extinct

State Ranks

S1 - Critically imperiled in state because of extreme rarity (very few individuals or acres) or because of some factors making it especially vulnerable to extinction
S2 - Imperiled in state because of rarity or because of some factor(s) making it especially vulnerable to extinction
S3 - Rare or uncommon within state
S4 - Apparently secure within the state
S5 - Demonstrably secure within the state
SA - Accidental in state, including species documented very few times or at very great intervals
SE - An exotic established in the state; native elsewhere
SH - Of historical occurrence in the state with the possibility of being rediscovered
SN - Regularly occurring, usually migratory and typically non-breeding
SR - Reported from state but without persuasive documentation
SU - Possibly in peril in state but status uncertain
SX - Apparently extirpated from state

MISSISSIPPI NATURAL HERITAGE PROGRAM
Special Animal List
9 February 1990

ELEMENT CODE	SCIENTIFIC NAME....................	COMMON NAME:........................	GLOBAL RANK	STATE RANK	FEDERAL STATUS
		AMPHIBIANS			
** AMBYSTOMATIDAE					
AAAAA01030	AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER	G4	SR	C2
AAAAA01140	AMBYSTOMA TIGRINUM	TIGER SALAMANDER	G5	S3	
** CRYPTOBRANCHIDAE					
AAAAC01010	CRYPTOBRANCHUS ALLEGANIENSIS	HELLBENDER	G4	S2	C2
** PLETHODONTIDAE					
AAAAD01010	ANEIDES AENEUS	GREEN SALAMANDER	G3G4	S1	C2
AAAAD05011	EURYCEA BISLINEATA BISLINEATA	NORTHERN TWO-LINED SALAMANDER	G5T5	S4S5	
AAAAD05042	EURYCEA LONGICAUDA LONGICAUDA	LONGTAIL SALAMANDER	G5T5	S4S5	
AAAAD05050	EURYCEA LUCIFUGA	CAVE SALAMANDER	G5	S1	
AAAAD06020	GYRINOPHILUS PORPHYRITICUS	SPRING SALAMANDER	G5	S1	
AAAAD08010	HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	G5	S3?	
AAAAD12030	PLETHODON DORSALIS	ZIGZAG SALAMANDER	G5Q	S3?	
AAAAD12210	PLETHODON WEBSTERI	WEBSTER'S SALAMANDER	G3Q	S3?	
AAAAD13010	PSEUDOTRITON MONTANUS	MUD SALAMANDER	G5	S3?	
AAAAD13020	PSEUDOTRITON RUBER	RED SALAMANDER	G5	S3S4	
** PROTEIDAE					
AAAAE01040	NECTURUS MACULOSUS	MUDPUPPY	G5	S4	
** BUFONIDAE					
AAABB01170	BUFO VALLICEPS	GULF COAST TOAD	G5	S3?	
** HYLIDAE					
AAABC05010	PSEUDACRIS BRACHYPHONA	MOUNTAIN CHORUS FROG	G5	S3?	
** RANIDAE					
AAABH01015	RANA AREOLATA SEVOSA	DUSKY GOPHER FROG	G5T2	S1	C2
AAABH01092	RANA CLAMITANS MELANOTA	GREEN FROG	G5T?	S4	
AAABH01120	RANA HECKSCHERI	RIVER FROG	G5	S3?	
		BIRDS			
** PELECANIDAE					
ABNFC01010	PELECANUS ERYTHRORHYNCHOS	AMERICAN WHITE PELICAN	G3	SN	
ABNFC01020	PELECANUS OCCIDENTALIS	BROWN PELICAN	G5	S1	LE
** PHALACROCORACIDAE					
ABNFD01020	PHALACROCORAX AURITUS	DOUBLE-CRESTED CORMORANT	G5	S3?	
** ARDEIDAE					
ABNGA06060	EGRETTA RUFESCENS	REDDISH EGRET	G4	SN	C2
ABNGA11010	NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON	G5	S3?	
** THRESKIORNITHIDAE					
ABNGE01010	EUDOCIMUS ALBUS	WHITE IBIS	G5	S4	
ABNGE02020	PLEGADIS CHIHI	WHITE-FACED IBIS	G5	SN	C2
** CICONIIDAE					
ABNGF02010	MYCTERIA AMERICANA	WOOD STORK	G5	SN	LE
** ANATIDAE					
ABNJB10050	ANAS FULVIGULA	MOTTLED DUCK	G4	S4	
** CATHARTIDAE					
ABNKA01010	CORAGYPS ATRATUS	BLACK VULTURE	G5	S4	
ABNKA02010	CATHARTES AURA	TURKEY VULTURE	G5	S4	
** ACCIPITRIDAE					
ABNKC01010	PANDION HALIAETUS	OSPREY	G5	S4	
ABNKC04010	ELANOIDES FORFICATUS	AMERICAN SWALLOW-TAILED KITE	G5	S2	

ABNKC10010	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G3	S1	LELT
ABNKC11010	CIRCUS CYANEUS	NORTHERN HARRIER	G5	SN	
ABNKC12020	ACCIPITER STRIATUS	SHARP-SHINNED HAWK	G5	S3?	
ABNKC12040	ACCIPITER COOPERII	COOPER'S HAWK	G4	S3?	
ABNKC19030	BUTEO LINEATUS	RED-SHOULDERED HAWK	G5	S4	
ABNKC22010	AQUILA CHRYSAETOS	GOLDEN EAGLE	G4	SN	
** FALCONIDAE					
ABNKD06020	FALCO SPARVERIUS	AMERICAN KESTREL	G5	S4?	
ABNKD06030	FALCO COLUMBARIUS	MERLIN	G4	SN	
ABNKD06070	FALCO PEREGRINUS	PEREGRINE FALCON	G3	SN	E/SA
** RALLIDAE					
ABNME01010	COTURNICOPS NOVEBORACENSIS	YELLOW RAIL	G4	SN	
ABNME03040	LATERALLUS JAMAICENSIS	BLACK RAIL	G4?	SN	
** GRUIDAE					
ABNMK01013	GRUS CANADENSIS PULLA	MISSISSIPPI SANDHILL CRANE	G5T1	S1	LE
** CHARADRIIDAE					
ABNNB03030	CHARADRIUS ALEXANDRINUS	SNOWY PLOVER	G4?	S3	C2
ABNNB03070	CHARADRIUS MELODUS	PIPING PLOVER	G2	SN	LELT
** HAEMATOPODIDAE					
ABNNC01010	HAEMATOPUS PALLIATUS	AMERICAN OYSTERCATCHER	G5	SN	
** LARIDAE					
ABNNM08010	STERNA NILOTICA	GULL-BILLED TERN	G5	S4?	
ABNNM08030	STERNA MAXIMA	ROYAL TERN	G5	S4	
ABNNM08100	STERNA ANTILLARUM	LEAST TERN	G4	S3	LE
** TYTONIDAE					
ABNSA01010	TYTO ALBA	COMMON BARN-OWL	G5	S4	
** STRIGIDAE					
ABNSB10010	ATHENE CUNICULARIA	BURROWING OWL	G5	SN	
** PICIDAE					
ABNYF07060	PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G2	S2	LE
ABNYF13040	CAMPEPHILUS PRINCIPALIS	IVORY-BILLED WOODPECKER	G1	SX	LE
** TYRANNIDAE					
ABPAE52070	TYRANNUS DOMINICENSIS	GRAY KINGBIRD	G5	SA	
ABPAE52100	TYRANNUS FORFICATUS	SCISSOR-TAILED FLYCATCHER	G5	SA	
** HIRUNDINIDAE					
ABPAU09010	HIRUNDO PYRRHONOTA	CLIFF SWALLOW	G5	S3	
** TROGLODYTIDAE					
ABPBG07010	THRYOMANES BEWICKII	BEWICK'S WREN	G5	S2S3	
** LANIIDAE					
ABPBR01030	LANIUS LUDOVICIANUS	LOGGERHEAD SHRIKE	G4	S4	
** VIREONIDAE					
ABPBW01110	VIREO BELLII	BELL'S VIREO	G5	SA?	
** EMBERIZIDAE					
ABPBX01010	VERMIVORA BACHMANII	BACHMAN'S WARBLER	GH	SX	LE
ABPBX91050	AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW	G3	S3?	C2
** FRINGILLIDAE					
ABPBY05010	LOXIA CURVIROSTRA	RED CROSSBILL	G5	SA	

FISHES

** PETROMYZONTIDAE					
AFAAA01020	ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY	G5	S4	
AFAAA01060	ICHTHYOMYZON UNICUSPIS	SILVER LAMPREY	G5	S3?	
** ACIPENSERIDAE					
AFCAA01020	ACIPENSER FULVESCENS	LAKE STURGEON	G3	SA	C2
AFCAA01040	ACIPENSER OXYRHYNCHUS	ATLANTIC STURGEON	G3	S2	

AFCAA02010 SCAPHIRHYNCHUS ALBUS	PALLID STURGEON	G1	S1	C2
AFCAA02X20 SCAPHIRHYNCHUS SP 2	ALABAMA SHOVELNOSE STURGEON	G1Q	S1	C2
** POLYODONTIDAE				
AFCAB01010 POLYODON SPATHULA	PADDLEFISH	G4	S4	3C
** HIODONTIDAE				
AFCGA01010 HIODON ALOSOIDES	GOLDEYE	G5	S4	
** CYPRINIDAE				
AFCJB05020 CLINOSTOMUS FUNDULOIDES	ROSYSIDE DACE	G5	S4	
AFCJB17060 HYBOPSIS GELIDA	STURGEON CHUB	G3	SA?	C2
AFCJB17070 HYBOPSIS GRACILIS	FLATHEAD CHUB	G5	SA?	
AFCJB17120 HYBOPSIS MEEKI	SICKLEFIN CHUB	G2	SA?	C2
AFCJB28090 NOTROPIS ARDENS	ROSEFIN SHINER	G5	S4	
AFCJB28200 NOTROPIS BOOPS	BIGEYE SHINER	G5	S3?	
AFCJB28260 NOTROPIS CALLISTIUS	ALABAMA SHINER	G5	S3?	
AFCJB28290 NOTROPIS CANDIDUS	SILVERSIDE SHINER	G3	S3?	
AFCJB28310 NOTROPIS CHALYBAEUS	IRONCOLOR SHINER	G5	S4?	
AFCJB28420 NOTROPIS EDWARDRANEYI	FLUVIAL SHINER	G3	S3	
AFCJB28730 NOTROPIS PETERSONI	COASTAL SHINER	G5	S4?	
AFCJB28760 NOTROPIS POTTERI	CHUB SHINER	G5	SA?	
AFCJB28810 NOTROPIS RUBELLUS	ROSYFACE SHINER	G5	S4	
AFCJB28910 NOTROPIS SPILOPTERUS	SPOTFIN SHINER	G5	S4	
AFCJB28A20 NOTROPIS WELAKA	BLUENOSE SHINER	G4	S4	
AFCJB28A30 NOTROPIS WHIPPLEI	STEELCOLOR SHINER	G5	S5?	
AFCJB30030 PHENACOBIUS MIRABILIS	SUCKERMOUTH MINNOW	G5	S4	
AFCJB31030 PHOXINUS ERYTHROGASTER	SOUTHERN REDBELLY DACE	G5	S2	
AFCJB37010 RHINICHTHYS ATRATULUS	BLACKNOSE DACE	G5	S4	
** CATOSTOMIDAE				
AFCJC04010 CYCLEPTUS ELONGATUS	BLUE SUCKER	G4	S4?	C2
AFCJC07030 ICTIOBUS NIGER	BLACK BUFFALO	G5	S4?	
AFCJC10070 MOXOSTOMA DUQUESNEI	BLACK REDHORSE	G5	S3?	
AFCJC10110 MOXOSTOMA MACROLEPIDOTUM	SHORTHEAD REDHORSE	G5	S3?	
** ICTALURIDAE				
AFCKA02070 NOTURUS FLAVUS	STONECAT	G5	S4	
AFCKA02170 NOTURUS MUNITUS	FRECKLEBELLY MADTOM	G3	S2	C2
AFCKA02220 NOTURUS STIGMOSUS	NORTHERN MADTOM	G4	S3?	
AFCKA02250 NOTURUS EXILIS	SLENDER MADTOM	G5	S3?	
** CYPRINODONTIDAE				
AFCNB04090 FUNDULUS JENKINSI	SALTMARSH TOPMINNOW	G3	S3	
AFCNB04260 FUNDULUS EURYZONUS	BROADSTRIPE TOPMINNOW	G2	S2	
AFCNB06010 LEPTOLUCANIA OMMATA	PYGMY KILLIFISH	G5?	SR	
** CENTRARCHIDAE				
AFCQB10020 ENNEACANTHUS GLORIOSUS	BLUESPOTTED SUNFISH	G5	S3?	
AFCQB10030 ENNEACANTHUS OBESUS	BANDED SUNFISH	G5	S3?	
** PERCIDAE				
AFCQC01010 AMMOCRYPTA ASPRELLA	CRYSTAL DARTER	G3	S2	C2
AFCQC01040 AMMOCRYPTA CLARA	WESTERN SAND DARTER	G3	S3?	
AFCQC02060 ETHEOSTOMA BLENNIOIDES	GREENSIDE DARTER	G5	S2S3	
AFCQC02250 ETHEOSTOMA FLABELLARE	FANTAIL DARTER	G5	S4	
AFCQC02380 ETHEOSTOMA KENNICOTTI	STRIPETAIL DARTER	G5	S4	
AFCQC02630 ETHEOSTOMA RUBRUM	BAYOU DARTER	G1	S1	LT
AFCQC02640 ETHEOSTOMA RUFILINEATUM	REDLINE DARTER	G5	S3	
AFCQC02880 ETHEOSTOMA ZONIFERUM	BACKWATER DARTER	G3	S3?	
AFCQC02970 ETHEOSTOMA NIGRIPINNE	BLACKFIN DARTER	G3G4	S4	
AFCQC02980 ETHEOSTOMA ZONISTIUM	BANDFIN DARTER	G4	S3S4	
AFCQC02X10 ETHEOSTOMA SP 1	YAZOO DARTER	G3Q	S3	C2
AFCQC04051 PERCINA CAPRODES CAPRODES	LOGPERCH	G5TU	S4	
AFCQC04060 PERCINA COPELANDI	CHANNEL DARTER	G5	S1S2	
AFCQC04090 PERCINA EVIDES	GILT DARTER	G4	S2	
AFCQC04110 PERCINA LENTICULA	FRECKLED DARTER	G2	S2?	C2
AFCQC04230 PERCINA PHOXOCEPHALA	SLENDERHEAD DARTER	G5	S2	
** COTTIDAE				
AFCQP02070 COTTUS CAROLINAE	BANDED SCULPIN	G5	S4	

MAMMALS

** SORICIDAE				
AMABA01060 SOREX LONGIROSTRIS	SOUTHEASTERN SHREW	G5	S4	
** VESPERTILIONIDAE				
AMACC01010 MYOTIS LUCIFUGUS	LITTLE BROWN BAT	G5	S3?	
AMACC01040 MYOTIS GRISESCENS	GRAY BAT	G2	SA	LE
AMACC01060 MYOTIS KEENII	KEEN'S BAT	G3?	S3?	
AMACC01100 MYOTIS SODALIS	INDIANA BAT	G2	SA	LE
AMACC05030 LASIURUS CINEREUS	HOARY BAT	G5	S3?	
AMACC05040 LASIURUS INTERMEDIUS	NORTHERN YELLOW BAT	G4G5	S2?	
AMACC08020 PLECOTUS RAFINESQUII	EASTERN BIG-EARED BAT	G4	S3?	C2
** MURIDAE				
AMAFF03060 PEROMYSCUS POLIONOTUS	OLDFIELD MOUSE	G5	S2S3	
** URSIDAE				
AMAJB01010 URSUS AMERICANUS	BLACK BEAR	G5	S1	
** FELIDAE				
AMAJH01021 FELIS CONCOLOR CORYI	FLORIDA PANTHER	G4T1	SH	LE
** TRICHECHIDAE				
AMAKA01010 TRICHECHUS MANATUS	MANATEE	G2?	SA	LE

REPTILES

** CHELONIDAE				
ARAAA01010 CARETTA CARETTA	LOGGERHEAD SEA TURTLE	G3	SN	LT
ARAAA02010 CHELONIA MYDAS	GREEN TURTLE	G3	SN	LELT
ARAAA03010 ERETMOCHELYS IMBRICATA	HAWKSBILL SEA TURTLE	G3	SN	LE
ARAAA04010 LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	G1	SN	LE
** CHELYDRIDAE				
ARAAB02010 MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3	S3?	C2
** DERMOCHELYIDAE				
ARAAC01010 DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	G3	SN	LE
** EMYDIDAE				
ARAAD03010 DEIROCHELYS RETICULARIA	CHICKEN TURTLE	G5	S4	
ARAAD05030 GRAPTEMYS FLAVIMACULATA	YELLOW-BLOTCHED SAWBACK	G2	S2	C2
ARAAD05050 GRAPTEMYS KOHNII	MISSISSIPPI MAP TURTLE	G5Q	S4?	
ARAAD05060 GRAPTEMYS NIGRINODA	BLACK-KNOBBED SAWBACK	G3	S2	3C
ARAAD05070 GRAPTEMYS OCULIFERA	RINGED SAWBACK	G2	S2	LT
ARAAD05110 GRAPTEMYS OUACHITENSIS	OUACHITA MAP TURTLE	G5Q	S5	
ARAAD06010 MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	G5	S3	
** TESTUDINIDAE				
ARAAF01030 GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G2	S1	LT
** ALLIGATORIDAE				
ARABA01010 ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR	G5	S4	T/SA
** SCINCIDAE				
ARACH01010 EUMECES ANTHRACINUS	COAL SKINK	G5	S4	
** COLUBRIDAE				
ARADB03010 CEMOPHORA COCCINEA	SCARLET SNAKE	G5	S4	
ARADB07017 COLUBER CONSTRICTOR LATRUNCULUS	BLACKMASK RACER	G5T?	S3?	
ARADB11011 DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE	G4T3	S1	LT
ARADB14020 FARANCIA ERYTROGRAMMA	RAINBOW SNAKE	G5	S2	
ARADB17030 HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE	G4G5	S2	
ARADB19012 LAMPROPELTIS CALLIGASTER RHOMBOMACU	MOLE KINGSNAKE	G5T?	S4	
ARADB19025 LAMPROPELTIS GETULA NIGRA	BLACK KINGSNAKE	G5T?	S3	
ARADB19054 LAMPROPELTIS TRIANGULUM ELAPSOIDES	SCARLET KINGSNAKE	G5T5	S4	
ARADB22031 NERODIA FASCIATA CLARKII	GULF SALT MARSH SNAKE	G5T4	S2S3	
ARADB22063 NERODIA SIPEDON SIPEDON	NORTHERN WATER SNAKE	G5T?	S4	
ARADB26011 PITUOPHIS MELANOLEUCUS LODINGI	BLACK PINE SNAKE	G5T2	S1	C2
ARADB27033 REGINA RIGIDA SINICOLA	GULF CRAYFISH SNAKE	G5T?	S3?	
ARADB27040 REGINA SEPTEMVITTATA	QUEEN SNAKE	G5	S4	
ARADB28010 RHADINAEA FLAVILATA	PINE WOODS SNAKE	G4	S3?	
ARADB36092 THAMNOPHIS PROXIMUS ORARIUS	GULF COAST RIBBON SNAKE	G5T?	S4	
** ELAPIDAE				
ARADC02010 MICRURUS FULVIUS	EASTERN CORAL SNAKE	G5	S4	

INVERTEBRATES: CRAYFISH AND SHRIMP

** CAMBARIDAE					
ICMAL09020	CAMBARELLUS DIMINUTUS	LEAST CRAYFISH	G?	S3	
ICMAL09030	CAMBARELLUS LESLIEI	A CRAYFISH	G?	S3?	
ICMAL13010	HOBBSEUS ATTENUATUS	PEARL RIVULET CRAYFISH	G?	S2?	
ICMAL13020	HOBBSEUS PETILUS	TOMBIGBEE RIVULET CRAYFISH	G?	S2?	
ICMAL13030	HOBBSEUS ORCONECTOIDES	OKTIBBEHA RIVULET CRAYFISH	G?	S2?	
ICMAL13040	HOBBSEUS VALLECULUS	CHOCTAW RIVULET CRAYFISH	GU	S3?	
ICMAL14010	PROCAMBARUS BIVITTATUS	RIBBON CRAYFISH	G?	S3S4	
ICMAL14020	PROCAMBARUS BARBIGER	JACKSON PRAIRIE CRAYFISH	G?	S2	
ICMAL14030	PROCAMBARUS COMETES	MISSISSIPPI FLATWOODS CRAYFISH	G?	S2?	
ICMAL14040	PROCAMBARUS CONUS	CARROLLTON CRAYFISH	G?	S1	C2
ICMAL14050	PROCAMBARUS FITZPATRICKI	SPINY-TAILED CRAYFISH	G?	S2	
ICMAL14060	PROCAMBARUS JACULUS	JAVELIN CRAYFISH	G?	S3?	
ICMAL14070	PROCAMBARUS LECONTEI	MOBILE CRAYFISH	G?	S3?	
ICMAL14080	PROCAMBARUS LAGNIAPPE	LAGNIAPPE CRAYFISH	G?	S3?	
ICMAL14090	PROCAMBARUS LYLEI	SHUTISPEAR CRAYFISH	G?	S2?	
ICMAL14100	PROCAMBARUS POGUM	BEARDED RED CRAYFISH	G?	S2	
ICMAL14210	PROCAMBARUS ABLUSUS	A CRAYFISH	G?	S2	
ICMAL14220	PROCAMBARUS PENNI	PEARL BLACKWATER CRAYFISH	G?	S3?	
ICMAL15010	FALLICAMBARUS BYERSI	LAVENDER BURROWING CRAYFISH	GUQ	S3	
ICMAL15050	FALLICAMBARUS DANIELAE	SPECKLED BURROWING CRAYFISH	G?	S3?	
ICMAL15070	FALLICAMBARUS BURRISI	BURRIS' BURROWING CRAWFISH	G?	S3	
ICMAL15080	FALLICAMBARUS GORDONI	CAMP SHELBY BURROWING CRAWFISH	G?	S2	
** PALAEMONIDAE					
ICMAL26010	MACROBRACHIUM CARCINUS	SHRIMP	G?	SU	

INVERTEBRATES: INSECTS

** CICINDELIDAE					
IICOL02060	CICINDELA MARGINIPENNIS	COBBLESTONE TIGER BEETLE	G2	S?	C2
** CERAMBYCIDAE					
IICOL03010	DRYOBIUS SEXNOTATUS	SIX-BANDED LONGHORN BEETLE	G?	S?	C2
** SCARABAEIDAE					
IICOL15010	ONTHOPHAGUS POLYPHEMI	ONTHOPHAGUS TORTOISE COMMENSAL SCAR	G?	S?	C2
** SILPHIDAE					
IICOL42010	NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	G1	S?	PE
** HYDRAENIDAE					
IICOL5P010	GYMNOCTHEBIUS MAUREENAE	MAUREEN'S GYMNOCTHEBIUS MINUTE MOSS	G1G3	S1S3	C2
** HYDROPHILIDAE					
IICOL5W010	PARACYMUS SECLUSUS	SECLUSIVE WATER SCAVENGER BEETLE	G1G3	S1S3	C2
** OLIGONEURIIDAE					
IIEPH03020	HOMOEONEURIA CAHABENSIS	CAHABA SAND-FILTERING MAYFLY	G1G3	S1S3	C2
** SESIIDAE					
IILEK0C320	SYNANTHEDON CASTANEAE	CHESTNUT CLEARWING MOTH	GX	S?	C2*
** GRYLLOTALPIDAE					
IIORT17010	GRYLLOTALPA MAJOR	PRAIRIE MOLE CRICKET	G2	SH	C2*

INVERTEBRATES: MUSSELS

** UNIONIDAE					
IMBIV04130	ANODONTA SUBORBICULATA	FLAT FLOATER	G4	S4	
IMBIV06010	ARCIDENS CONFRAGOSUS	ROCK POCKETBOOK	G3	S3?	
IMBIV14030	ELLIPTIO ARCA	ALABAMA SPIKE	G?	S3S4	
IMBIV16130	EPIOBLASMA PENITA	SOUTHERN COMBSHELL	G1	S1	LE
IMBIV21140	LAMPSILIS PEROVALIS	ORANGE-NACRE MUCKET	G1	S1	C2
IMBIV22010	LASMIGONA COMPLANATA	WHITE HEELSPLITTER	G5	S4	
IMBIV26020	LIGUMIA RECTA	BLACK SANDSHELL	G5	S3S4	
IMBIV28010	MEDIONIDUS ACUTISSIMUS	ALABAMA MOCCASINSHELL	G1	S1	
IMBIV28030	MEDIONIDUS MACGLAMERIAE	TOMBIGBEE MOCCASINSHELL	GX	SX	
IMBIV31060	OBOVARIA UNICOLOR	ALABAMA HICKORYNUT	G3G4	S3S4	
IMBIV35100	PLEUROBEMA CURTUM	BLACK CLUBSHELL	GH	SH	LE
IMBIV35110	PLEUROBEMA DECISUM	SOUTHERN CLUBSHELL	G1G2	S1S2	

IMBIV35180 PLEUROBEMA MARSHALLI	FLAT PIGTOE	GH	SH	LE
IMBIV35230 PLEUROBEMA PEROVATUM	OVATE CLUBSHELL	G1	S1	
IMBIV35250 PLEUROBEMA PYRAMIDATUM	PYRAMID PIGTOE	G2G3	S2	C2
IMBIV35300 PLEUROBEMA TAITIANUM	HEAVY PIGTOE	G1	S1	LE
IMBIV37010 POTAMILUS ALATUS	PINK HEELSPLITTER	G5	S3?	
IMBIV37040 POTAMILUS INFLATUS	INFLATED HEELSPLITTER	G1	SH	C2
IMBIV39041 QUADRULA CYLINDRICA CYLINDRICA	RABBITSFOOT	G3T2T3	S2?	
IMBIV39090 QUADRULA NODULATA	WARTYBACK	G3	S3	
IMBIV39160 QUADRULA STAPES	STIRRUPSHELL	G1	SH	LE
IMBIV42020 STROPHITUS SUBVEXUS	SOUTHERN CREEKMUSSEL	G1	S1	
IMBIV42030 STROPHITUS UNDULATUS	SQUAWFOOT	G5	S3?	
IMBIV45020 TRUNCILLA DONACIFORMIS	FAWNSFOOT	G4	S3?	
IMBIV45040 TRUNCILLA TRUNCATA	DEERTOE	G4	S3?	

<u>INVERTEBRATES: SNAILS</u>

** ELLOBIIDAE			
IMGAS07050 CARYCHIUM NANNODES	CORPULENT THORN	G4G5	S?
** PUPILLIDAE			
IMGAS15100 GASTROCOPTA PELLUCIDA	SLIM SNAGGLETOOTH	G4G5	S?
IMGAS15180 GASTROCOPTA ABBREVIATA	SNAIL	G?	S?
IMGAS18020 PUPISOMA MACNEILLI	GULF BABYBODY	G?	S?
IMGAS20260 VERTIGO OSCARIANA	CAPITAL VERTIGO	G4	S?
IMGAS20360 VERTIGO TESKEYAE	SNAIL	G4	S?
** PHILOMYCIDAE			
IMGAS64020 PHILOMYCUS TOGATUS	TOGA MANTLESLUG	G4G5	S?
** SUCCINEIDAE			
IMGAS[illegible]6090 SUCCINEA LUTEOLA	SPANISH AMBERSNAIL	G?	S?
** ZONITIDAE			
IMGAS72020 GASTRODONTA INTERNA	BROWN BELLYTOOTH	G?	S?
IMGAS75020 MESOMPHIX ANURUS	FROG BUTTON	G?	S?
IMGAS75030 MESOMPHIX CAPNODES	DUSKY BUTTON	G4G5	S?
IMGAS75110 MESOMPHIX PILSBRYI	STRIATE BUTTON	G?	S?
IMGAS78280 PARAVITREA SIGNIFICANS	DOMED SUPERCOIL	G?	S?
IMGAS82100 VENTRIDENS GULARIS	THROATY DOME	G4G5	S?
** POLYGYRIDAE			
IMGAS95130 MESODON ELEVATUS	PROUD GLOBE	G5	S?
IMGAS95380 MESODON ZALETUS	TOOTHED GLOBE	G5	S?
IMGAS96160 POLYGYRA SEPTEMVOLVA	FLORIDA FLATCOIL	G?	S?
IMGAS97060 PRATICOLELLA LAWAE	APPALACHIAN SHRUBSNAIL	G?	S?
IMGAS97070 PRATICOLELLA MOBILIANA	MOBILE SHRUBSNAIL	G?	S?
IMGAS98220 STENOTREMA SPINOSUM	CARINATE SLITMOUTH	G4	S?
IMGASA1020 TRIODOPSIS ALBOLABRIS	WHITELIP	G5	S?
IMGASA1360 TRIODOPSIS TRIDENTATA	NORTHERN THREE-TOOTH	G5	S?
IMGASA1390 TRIODOPSIS VULGATA	DISHED THREE-TOOTH	G5	S?
** PLEUROCERIDAE			
IMGASK2310 ELIMIA CYLINDRACEA	CYLINDER ELIMIA	G?	S?
IMGASK6050 LITHASIA HUBRICHTI	BIG BLACK ROCKSNAIL	G?	S?
** ASSIMINEIDAE			
IMGASR2010 ASSIMINEA MODESTA	SNAIL	G?	S?

247 species

MISSISSIPPI NATURAL HERITAGE PROG AM
Special Plant List
10 JULY 1990

ELEMENT CODE	SCIENTIFIC NAME....................	COMMON NAME:.......................	GLOBAL RANK	STATE RANK	FEDERAL STATUS
** HYPNACEAE					
NBMUS1C010	HETEROPHYLLIUM HALDANIANUM	A MOSS		S?	
** HOOKERIACEAE					
NBMUS3P010	HOOKERIOPSIS HETEROICA	A MOSS		S?	
** BRYACEAE					
NBMUS6F010	RHODOBRYUM ROSEUM	A MOSS		S?	
** ACANTHACEAE					
PDACA0J0C0	RUELLIA NOCTIFLORA	NIGHT-FLOWERING RUELLIA	G3?	S3	
PDACA0J0N0	RUELLIA PINETORUM	PINE BARREN RUELLIA	G?	S1?	
** APIACEAE					
PDAPI07040	ANGELICA ATROPURPUREA	GREAT ANGELICA	G5	S?	
PDAPI0Z030	ERYNGIUM AQUATICUM	MARSH ERYNGO	G4	S1	
PDAPI0Z0F0	ERYNGIUM HOOKERI	HOOKER'S ERYNGO	G3G5	S1S2	
PDAPI18040	LIGUSTICUM CANADENSE	NONDO LOVAGE	G4	S1S2	
PDAPI19010	LILAEOPSIS CAROLINENSIS	CAROLINA LILAEOPSIS	G3	S2S3	C2
PDAPI1K040	OSMORHIZA CLAYTONII	HAIRY SWEET-CICELY	G5	SU	
PDAPI1K060	OSMORHIZA LONGISTYLIS	SMOOTHER SWEET-CICELY	G5	S3	
PDAPI1N010	PERIDERIDIA AMERICANA	EASTERN EULOPHUS	G4	S2	
PDAPI1U010	POLYTAENIA NUTTALLII	PRAIRIE PARSLEY	G5	S2	
PDAPI26010	TAENIDIA INTEGERRIMA	YELLOW PIMPERNELL	G5	S1	
PDAPI28020	THASPIUM PINNATIFIDUM	CUTLEAF MEADOW-PARSNIP	G3G5	S2S3	
** APOCYNACEAE					
PDAPO030C0	AMSONIA LUDOVICIANA	CREOLE PHLOX	G2G3	SH	C2
** AQUIFOLIACEAE					
PDAQU01020	ILEX AMELANCHIER	JUNEBERRY HOLLY	G3G4	S3	C2
PDAQU01070	ILEX CASSINE	DAHOON HOLLY	G5	S1S2	
PDAQU010N0	ILEX MONTANA	MOUNTAIN HOLLY	G5	S2S3	
PDAQU010P0	ILEX MYRTIFOLIA	MYRTLE HOLLY	G5?	S3	
** ARALIACEAE					
PDARA09010	PANAX QUINQUEFOLIUS	AMERICAN GINSENG	G4	S3	3C
** ARISTOLOCHIACEAE					
PDARI02020	ASARUM CANADENSE	CANADA WILD-GINGER	G5	S2S3	
PDARI03070	HEXASTYLIS SHUTTLEWORTHII	LARGE-FLOWERED HEARTLEAF	G4	S1	
** ASCLEPIADACEAE					
PDASC020R0	ASCLEPIAS HIRTELLA	PRAIRIE MILKWEED	G5	S?	
PDASC021J0	ASCLEPIAS PURPURASCENS	PURPLE MILKWEED	G4G5	S?	
PDASC0A070	MATELEA CAROLINENSIS	CAROLINA ANGLEPOD	G4	SU	
** ASTERACEAE					
PDAST0D010	GUTIERREZIA DRACUNCULOIDES	BROOM-SNAKEROOT	G4G5	S1S3	
PDAST0H0Q0	ANTENNARIA SOLITARIA	SINGLE-HEADED PUSSYTOES	G5	S2S4	
PDAST0T100	ASTER ERICOIDES	WHITE HEATH ASTER	G5	S2	
PDAST0T2L0	ASTER PUNICEUS	PURPLE-STEMMED ASTER	G5	S1	
PDAST180F0	BIDENS CORONATA	GOLDEN FLOWERED BEGGAR :ICK	G5	SU	
PDAST1K060	CACALIA MUHLENBERGII	GREAT INDIAN-PLANTAIN	G3G4	S1	
PDAST29010	CHRYSOGONUM VIRGINIANUM	GREEN-AND-GOLD	G5	S2	
PDAST2L010	COREOPSIS AURICULATA	LOBED TICKSEED	G5	S2S3	
PDAST2L020	COREOPSIS BASALIS	GOLDEN-MANE TICKSEED	G5	S2S3	
PDAST2L0M0	COREOPSIS NUDATA	GEORGIA TICKSEED	G3?	S2S3	
PDAST2L0Z0	COREOPSIS HELIANTHOIDES	SOUTHEASTERN TICKSEED	G3G4Q	S2S3	
PDAST38060	ECHINACEA PURPUREA	EASTERN PURPLE CONEFLOWER	G4G5	S3S4	
PDAST3P0X0	EUPATORIUM IVIFOLIUM	AN OSMIA	G5	S3S4	
PDAST4L090	HELENIUM DRUMMONDII	DRUMMOND'S SNEEZEWEED	G4G5	S2S3	
PDAST4W1P0	HIERACIUM VENOSUM	RATTLESNAKE HAWKWEED	G5	S?	

PDAST66070 MARSHALLIA TENUIFOLIA	NARROW-LEAF BARBARA'S BUTTON	G4G5	S3S4	
PDAST6F010 MIKANIA CORDIFOLIA	A HEMPWEED	G5	S3S4	
PDAST6T020 PALAFOXIA CALLOSA	A PALAFOXIA	G4G5	S1	
PDAST7K040 PRENANTHES ASPERA	ROUGH RATTLESNAKE-ROOT	G4?	S3	
PDAST85060 RUDBECKIA GRANDIFLORA	ROUGH CONEFLOWER	G5	S1	
PDAST8P1Z0 SOLIDAGO SPHACELATA	FALSE GOLDENROD	G4G5	S2S3	
PDAST8P2C0 SOLIDAGO FLACCIDIFOLIA	A GOLDENROD	G5	S2S3	
PDAST98040 THELESPERMA FILIFOLIUM	GREENTHREADS	G4G5	S1	
** BORAGINACEAE				
PDBORON0P0 MERTENSIA VIRGINICA	VIRGINIA BLUEBELLS	G5	S1S2	
** BRASSICACEAE				
PDBRA06060 ARABIS CANADENSIS	SICKLEPOD	G5	S2S3	
PDBRA06140 ARABIS LYRATA	DWARF ROCKCRESS	G5	SH	
PDBRA061D0 ARABIS PATENS	SPREADING ROCKCRESS	G3G4	S1	
PDBRA07010 ARMORACIA AQUATICA	LAKE CRESS	G4?	S1S2	
PDBRA0K170 DENTARIA DIPHYLLA	PEPPER-ROOT	G5	S1S2	
PDBRA0W030 DENTARIA HETEROPHYLLA	SLENDER TOOTHWORT	G5	S2S3	
PDBRA1N0R0 LESQUERELLA GRACILIS	A BLADDER-POD	G5	S1S3	
** BUXACEAE				
PDBUX02010 PACHYSANDRA PROCUMBENS	ALLEGHENY-SPURGE	G4G5	S3	
** CAMPANULACEAE				
PDCAM0E030 LOBELIA APPENDICULATA	APPENDAGED LOBELIA	G4G5	S2S3	
** CARYOPHYLLACEAE				
PDCAR0L0A0 PARONYCHIA ERECTA	GULF ROCKROSE	G3G4	S3?	
PDCAR0U180 SILENE OVATA	OVATE CATCHFLY	G3	S2	
PDCAR0X0Y0 STELLARIA PUBERA	GIANT CHICKWEED	G4G5	S2S3	
** CELASTRACEAE				
PDCEL03020 CELASTRUS SCANDENS	CLIMBING BITTERSWEET	G5	S2S4	
PDCEL05030 EUONYMUS ATROPURPUREUS	BURNING BUSH	G5	S2S3	
** CISTACEAE				
PDCIS02010 HELIANTHEMUM ARENICOLA	GULF ROCKROSE	G3G4	S3?	
** CLUSIACEAE				
PDCLU03160 HYPERICUM MYRTIFOLIUM	MYRTLE-LEAVED ST. JOHNSWORT	G4G5	S1	
** CONVOLVULACEAE				
PDCON0A130 IPOMOEA PES-CAPRAE	RAILROAD VINE	G5?	S2S3	
** CORNACEAE				
PDCOR01010 CORNUS ALTERNIFOLIA	ALTERNATE-LEAVED DOGWOOD	G5	S2S3	
** CAPPARACEAE				
PDCPP0[illegible]040 POLANISIA TENUIFOLIA	SLENDER-LEAVED CLAMMY-WEED	G5	S1S2	
** CAPRIFOLIACEAE				
PDCPR06010 TRIOSTEUM ANGUSTIFOLIUM	NARROW-LEAF FEVER ROOT	G5	S3	
PDCPR07010 VIBURNUM ACERIFOLIUM	MAPLE-LEAVED VIBURNUM	G5	S1	
** CRASSULACEAE				
PDCRA0A110 SEDUM PULCHELLUM	ROOK STONECROP	G5	S1S3	
PDCRA0A1L0 SEDUM TERNATUM	WOOD STONECROP	G5	S3	
** [illegible]ACEAE				
PDERI09010 CHIMAPHILA MACULATA	SPOTTED WINTERGREEN	G5	S1S2	
PDERI[illegible]010 EPIGAEA REPENS	TRAILING ARBUTUS	G5	S2S3	
PDERI[illegible]040 GAYLUSSACIA FRONDOSA	DANGLEBERRY	G5	S2S3	
PDERI10020 PIERIS PHILLYREIFOLIA	CLIMBING FETTER-BUSH	G3?	S1	3C
PDERI15030 RHODODENDRON ARBORESCENS	SMOOTH AZALEA	G4G5	S1	
PDERI15050 RHODODENDRON AUSTRINUM	FLORIDA FLAME AZALEA	G3G4	S2S3	3C
PDERI18100 VACCINIUM TENELLUM	GALE-LEAF BLUEBERRY	G5	S2	

** FABACEAE					
PDFAB0D020	APIOS PRICEANA	PRICE'S POTATOE BEAN	G2	S1	C1
PDFAB0F1Q0	ASTRAGALUS CANADENSIS	RATTLE-VETCH	G5	S2S3	
PDFAB0F2Y2	ASTRAGALUS DISTORTUS VAR ENGELMANNI	ENGELMAN'S BENT MILK-VETCH	G5TU	S1S2	
PDFAB0Y010	CLADRASTIS KENTUKEA	YELLOWWOOD	G4	S2	3C
PDFAB1A083	PETALOSTEMON GRACILIS	PINE BARRENS PRAIRIE CLOVER	G5T3T4	S2S3	
PDFAB1X010	GYMNOCLADUS DIOICUS	KENTUCKY COFFEE-TREE	G5	S2	
PDFAB330G0	PHASEOLUS SINUATUS	A WILD BEAN	G2G3	S2?	
** FAGACEAE					
PDFAG05040	QUERCUS ARKANSANA	ARKANSAS OAK	G3	SU	3C
PDFAG05190	QUERCUS MACROCARPA	BUR OAK	G5	S2	
PDFAG051D0	QUERCUS MINIMA	DWARF LIVE OAK	G5	S1	
PDFAG051H0	QUERCUS MYRTIFOLIA	MYRTLE-LEAVED OAK	G5	S4	
PDFAG051M0	QUERCUS OGLETHORPENSIS	OGLETHORPE OAK	G2	S2?	C2
PDFAG052E0	QUERCUS MISSISSIPPIENSIS	DELTA POST OAK	G3Q	S3	
** GENTIANACEAE					
PDGEN04010	EUSTOMA EXALTATUM	TALL PRAIRIE-GENTAIN	G4G5	S1S3	
PDGEN05030	SWERTIA CAROLINIENSIS	AMERICAN COLOMBO	G5	S2S3	
PDGEN0F080	SABATIA CAMPESTRIS	PRAIRIE PINK	G5?	S2S3	
** HYDROPHYLLACEAE					
PDHYD08010	HYDROPHYLLUM APPENDICULATUM	APPENDAGED WATERLEAF	G5	S1	
PDHYD08050	HYDROPHYLLUM MACROPHYLLUM	LARGER WATERLEAF	G5	S1	
PDHYD0C0F0	PHACELIA BIPINNATIFIDA	FERN-LEAVED PHACELIA	G5	S1	
PDHYD0C1B0	PHACELIA DUBIA	SMALL-FLOWERED SCORPIONWEED	G5	S2S3	
** JUGLANDACEAE					
PDJUG01060	CARYA LACINIOSA	BIG SHELLBARK HICKORY	G5	S2S3	
PDJUG01070	CARYA LEIODERMIS	SWAMP HICKORY	G3G5	S2S3	
PDJUG02030	JUGLANS CINEREA	WHITE WALNUT	G5?	S2	
** LAMIACEAE					
PDLAM0D020	CONRADINA CANESCENS	SEASIDE BALM	G5	S1	
PDLAM0G020	DRACOCEPHALUM PARVIFLORUM	AMERICAN DRAGONHEAD	G5	S1S2	
PDLAM0X020	LYCOPUS AMPLECTENS	SESSILE-LEAVED BUGLEWEED	G5	S2S3	
PDLAM1N0A0	PYCNANTHEMUM MUTICUM	BLUNT MOUNTAINMINT	G5	S2S3	
PDLAM1N0C0	PYCNANTHEMUM PILOSUM	HAIRY MOUNTAINMINT	G5Q	S1S4	
PDLAM1N0E0	PYCNANTHEMUM SETOSUM	AWNED MOUNTAIN-MINT	G3G5	S1S3	
PDLAM1S1U0	SALVIA URTICIFOLIA	NETTLE-LEAF SAGE	G5	S2S3	
** LAURACEAE					
PDLAU07020	LINDERA MELISSIFOLIA	PONDBERRY	G2	S1	LE
PDLAU07030	LINDERA SUBCORIACEA	BOG SPICE BUSH	G2	S1	C2
** LINACEAE					
PDLIN020J0	LINUM MACROCARPUM	LARGE FRUITED FLAX	G2?	S1?	C2
** LENTIBULARIACEAE					
PDLNT01050	PINGUICULA PLANIFOLIA	CHAPMAN'S BUTTERWORT	G3?	S2	C2
PDLNT01060	PINGUICULA PRIMULIFLORA	SOUTHERN BUTTERWORT	G3G4	S3	
PDLNT01070	PINGUICULA PUMILA	DWARF BUTTERWORT	G4	S2	
PDLNT020G0	UTRICULARIA PURPUREA	PURPLE BLADDDRWORT	G5	S2S4	
** LYTHRACEAE					
PDLYT02080	CUPHEA VISCOSISSIMA	BLUE WAXWEED	G5?	S1?	
PDLYT03010	DECODON VERTICILLATUS	HAIRY SWAMP LOOSESTRIFE	G5	S2S3	
** MAGNOLIACEAE					
PDMAG02090	MAGNOLIA TRIPETALA	UMBRELLA MAGNOLIA	G4G5	S1S3	
** MALVACEAE					
PDMAL0A080	CALLIRHOE TRIANGULATA	CLUSTERED POPPY-MALLOW	G3G5	S1S2	
PDMAL0H0C0	HIBISCUS COCCINEUS	BRILLANT HIBISCUS	G4?	S2	
** MENISPERMACEAE					
PDMNS05010	MENISPERMUM CANADENSE	CANADA MOONSEED	G5	S3S4	
** MENYANTHACEAE					
PDMNY03010	NYMPHOIDES AQUATICA	BIG FLOATING HEART	G5	S2S3	
PDMNY03020	NYMPHOIDES CORDATA	FLOATING-HEART	G5	S1S2	

** NYMPHAEACEAE					
PDNYM05080	NYMPHAEA MEXICANA	BANANA WATER-LILY	G4G5	SH	
** OLEACEAE					
PDOLE02040	FORESTIERA LIGUSTRINA	UPLAND SWAMP PRIVET	G4G5	S2	
PDOLE040E0	FRAXINUS PROFUNDA	PUMPKIN ASH	G4G5	S3	
PDOLE040F0	FRAXINUS QUADRANGULATA	BLUE ASH	G5	S2	
** ONAGRACEAE					
PDONA0C0H0	OENOTHERA GRANDIFLORA	LARGE-FLOWERED EVENING-PRIMROSE	G?NE	S1S3	
PDONA0C1D0	OENOTHERA TRILOBA	PRAIRIE EVENING-PRIMROSE	G4	SU	
** OXALIDACEAE					
PDOXA010P1	OXALIS PRICEAE SSP PRICEAE	PRICE'S YELLOW WOOD SORREL	G?T?	S1?	
** PAPAVERACEAE					
PDPAP09030	DICENTRA CUCULLARIA	DUTCHMAN'S BREECHES	G5	S1	
** POLYGALACEAE					
PDPGL020N0	POLYGALA HOOKERI	HOOKER'S MILKWORT	G3G4	S1S2	
** POLEMONIACEAE					
PDPLM0E0K0	POLEMONIUM REPTANS	JACOB'S LADDER	G5?	S2S3	
** PRIMULACEAE					
PDPRI030B0	DODECATHEON MEADIA	SHOOTINGSTAR	G5	S2	
PDPRI06010	HOTTONIA INFLATA	FEATHERFOIL	G3G4	S1S3	
** RANUNCULACEAE					
PDRAN040L0	ANEMONE QUINQUEFOLIA	WOOD ANEMONE	G5	S1S2	
PDRAN05040	AQUILEGIA CANADENSIS	WILD COLUMBINE	G5		
PDRAN07050	CIMICIFUGA RACEMOSA	BLACK BUGBANE	G5	S2	
PDRAN080D0	CLEMATIS GLAUCOPHYLLA	WHITE-LEAVED LEATHER-FLOWER	G3?	S2S3	
PDRAN08170	CLEMATIS BEADLEI	VASE-VINE LEATHER-FLOWER	G2G3Q	S2S3	
PDRAN0B1T0	DELPHINIUM TRICORNE	DWARF LARKSPUR	G5	S2	
PDRAN0F010	HYDRASTIS CANADENSIS	GOLDEN SEAL	G4	S1	3C
PDRAN0M070	THALICTRUM DEBILE	SOUTHERN MEADOW-RUE	G2G4Q	S2S3	3C
PDRAN0N010	TRAUTVETTERIA CAROLINIENSIS	CAROLINA TASSEL-RUE	G4G5	S1	
** RHAMNACEAE					
PDRHA0C090	RHAMNUS LANCEOLATA	LANCE-LEAVED BUCKTHORN	G4G5	S2	
PDRHA0D010	SAGERETIA MINUTIFLORA	TINY-LEAVED BUCKTHORN	G4	S2	3C
** ROSACEAE					
PDROS03040	AGRIMONIA INCISA	INCISED GROOVEBUR	G3	S1S3	C2
PDROS0H0N0	CRATAEGUS BRACHYACANTHA	BLUEBERRY HAWTHORN	G4	SU	
PDROS14010	NEVIUSIA ALABAMENSIS	ALABAMA SNOW-WREATH	G2	S1	C2
PDROS1Q0D0	SPIRAEA TOMENTOSA	HARDHACK SPIRAEA	G5	SH	
** SALICACEAE					
PDSAL020M0	SALIX CAROLINIANA	CAROLINA WILLOW	G5	S3S4	
** SANTALACEAE					
PDSAN05010	NESTRONIA UMBELLULA	NESTRONIA	G3G4	S1S2	C2
** SARRACENIACEAE					
PDSAR02030	SARRACENIA LEUCOPHYLLA	CRIMSON PITCHER-PLANT	G3	S3	
PDSAR02070	SARRACENIA PURPUREA	SIDE-SADDLE PITCHER-PLANT	G5	S1	
PDSAR02084	SARRACENIA RUBRA SSP WHERRYI	WHERRY'S PITCHER-PLANT	G3T2	S1	C2
** SAXIFRAGACEAE					
PDSAX0E143	HEUCHERA VILLOSA VAR MACRORHIZA	GIANT ALUMROOT	G5T4Q	S1	
PDSAX0P060	PARNASSIA GRANDIFOLIA	LARGE-LEAVED GRASS-OF-PARNASSUS	G2G3	S1	
PDSAX0S0C0	PHILADELPHUS HIRSUTUS	HAIRY MOCK-ORANGE	G5	S1	
PDSAX0S0E0	PHILADELPHUS INODORUS	ODORLESS MOCK-ORANGE	G4G5	S2S3	
PDSAX10010	TIARELLA CORDIFOLIA	HEART-LEAVED FOAM-FLOWER	G5	S2	
** SCHISANDRACEAE					
PDSCH01020	SCHISANDRA GLABRA	SCARLET WOODBINE	G4	S3?	3C

** SCROPHULARIACEAE					
PDSCR01020	AGALINIS APHYLLA	COASTAL PLAIN FALSE-FOXGLOVE	G3G4	S2S4	
PDSCR010P0	AGALINIS PSEUDAPHYLLA	SHINNERS' FALSE-FOXGLOVE	G2?Q	S2	C2
PDSCR01100	AGALINIS FILICAULIS	THIN STEMMED FALSE-FOXGLOVE	G3G4	S2?	
PDSCR0D0J0	CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH	G5	S1	
PDSCR0F020	CHELONE GLABRA	WHITE TURTLEHEAD	G5	S3	
PDSCR0F030	CHELONE LYONII	PINK TURTLEHEAD	G4	S1	
PDSCR0F040	CHELONE OBLIQUA	RED TURTLEHEAD	G4	SH	
PDSCR0R020	GRATIOLA BREVIFOLIA	STICKY HEDGE-HYSSOP	G4	S2S4	
PDSCR13010	MACRANTHERA FLAMMEA	FLAME FLOWER	G3	S3?	
PDSCR1B2F0	MIMULUS RINGENS	SQUARE-STEMMED MONKEY FLOWER	G5	S2S3	
PDSCR1L640	PENSTEMON TENUIFLORUS	NARROW FLOWERED BEARD TONGUE	G3?	S2?	
PDSCR1L650	PENSTEMON TENUIS	SLENDER BEARD TONGUE	G3G4	S2S3	
PDSCR1Q010	SCHWALBEA AMERICANA	CHAFFSEED	G2	S1	C2
PDSCR1X010	TOMANTHERA AURICULATA	EARLEAF FALSE-FOXGLOVE	G2	S1	C2
** SAPINDACEAE					
PDSPN0C030	SAPINDUS MARGINATUS	FLORDIA SOAPBERRY	G5	S2S3	
** STAPHYLEACEAE					
PDSTA01020	STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT	G5	S3	
** THEACEAE					
PDTHC04010	GORDONIA LASIANTHUS	LOBLOLLY BAY	G5	S1S2	
PDTHC06010	STEWARTIA MALACODENDRON	SILKY CAMELLIA	G4	S3S4	
PDTHC06020	STEWARTIA OVATA	MOUNTAIN CAMELLIA	G4	S1	
** THYMELAEACEAE					
PDTHY03020	DIRCA PALUSTRIS	EASTERN LEATHERWOOD	G4	S3	
** VERBENACEAE					
PDVER03020	AVICENNIA NITIDA	BLACK MANGROVE	G5	SH	
** VIOLACEAE					
PDVIO02020	HYBANTHUS CONCOLOR	GREEN VIOLET	G5	S2	
PDVIO041R1	VIOLA PUBESCENS VAR ERIOCARPA	SMOOTH YELLOW VIOLET	G5T5	S1S2	
** CUPRESSACEAE					
PGCUP03030	CHAMAECYPARIS THYOIDES	ATLANTIC WHITE CEDAR	G4	S3	
PGCUP050D0	JUNIPERUS SILICICOLA	SOUTHERN RED CEDAR	G4G5Q	SU	
** PINACEAE					
PGPIN04160	PINUS VIRGINIANA	VIRGINIA PINE	G5	S2	
** ALISMATACEAE					
PMALI01040	ALISMA SUBCORDATUM	BROAD-LEAVED WATER-PLATAIN	G?	SH	
PMALI02030	ECHINODORUS ROSTRATUS	ERECT BURHEAD	G5	SH	
PMALI02050	ECHINODORUS PARVULUS	DWARF BURHEAD	G2G3Q	S1	
** ARACEAE					
PMARA0E020	PELTANDRA SAGITTIFOLIA	WHITE ARUM	G3G4	S2S3	
** ARECACEAE					
PMARE0B010	RHAPIDOPHYLLUM HYSTRIX	NEEDLE PALM	G4	S3	3C
** CANNACEAE					
PMCAN01030	CANNA FLACCIDA	GOLDEN CANNA	G5?	S1	
** COMMELINACEAE					
PMCOM0B060	TRADESCANTIA ERNESTIANA	PALMER'S SPIDERWORT	G3G5	S1	
** CYPERACEAE					
PMCYP034F0	CAREX EXILIS	COAST SEDGE	G5	S1	
PMCYP035C0	CAREX GRACILESCENS	SLENDER SEDGE	G5?	S1S3	
PMCYP036P0	CAREX JAMESII	NEBRASKA SEDGE	G5	S1S2	
PMCYP03760	CAREX LAXIFLORA	LOOSE-FLOWERED SEDGE	G5	S1S3	
PMCYP03870	CAREX MEADII	MEAD'S SEDGE	G4G5	S3	
PMCYP038J0	CAREX MICRODONTA	SMALL-TOOTHED SEDGE	G3	S2?	
PMCYP03AK0	CAREX PICTA	PAINTED SEDGE	G4G5	S2S3	
PMCYP03B10	CAREX PRASINA	DROOPING SEDGE	G4	S1	
PMCYP03CC0	CAREX SEORSA	SEPARATED SEDGE	G4	S1S3	
PMCYP03D30	CAREX STRICTA	UPTIGHT SEDGE	G5	S2	
PMCYP03EK0	CAREX VIRESCENS	RIBBED SEDGE	G5	S1?	
PMCYP03EQ0	CAREX STRIATA	WALTER'S SEDGE	G4	S1S3	

PMCYP03FB0	CAREX IMPRESSINERVIA	SOUTHE[illegible]IED [illegible]EDGE	G2?	S1	
PMCYP06020	CYPERUS ALBOMARGINATUS	WHITE[illegible]GE	G5	S3S4	
PMCYPON1C0	RHYNCHOSPORA MACRA	LARGE BEAKRUSH	G3G4	S3	
PMCYPON2D0	RHYNCHOSPORA TRACYI	TRACY'S BEAKRUSH	G4	S1	
** ERIOCAULACEAE					
PMERI010A0	ERIOCAULON TEXENSE	TEXAS PIPEWORT	G3G4	S3	
PMERI02030	LACHNOCAULON DIGYNUM	A BOG BUTTON	G3	S2	C2
** HYDROCHARITACEAE					
PMHYD04030	HALOPHILA ENGELMANNII	ENGELMANN'S SEA-GRASS	G3G5	S1SH	
PMHYD09010	THALASSIA TESTUDINA	TURTLE-GRASS	G?	S1SH?	
** IRIDACEAE					
PMIRI01010	ALOPHIA DRUMMONDII	PINEWOODS-LILY	G4	S1	
PMIRI08011	HERBERTIA LAHUE SSP CAERULEA	HERBERTIA	G3G5T2	SU	
PMIRI090B0	IRIS FULVA	RED FLAG	G5	S3S4	
PMIRI0B020	NEMASTYLIS GEMINIFLORA	PRAIRIE-IRIS	G4	S1	
** JUNCACEAE					
PMJUN011C0	JUNCUS GYMNOCARPUS	NAKED-FRUITED RUSH	G2G3	S2	3C
PMJUN02010	LUZULA ACUMINATA	HAIRY WOODRUSH	G5	S3	
** LILIACEAE					
PMLIL0E050	CAMASSIA SCILLOIDES	WILD HYACINTH	G4G5	S2S3	
PMLIL0L010	COOPERIA DRUMMONDII	EVENING RAINLILY	G5	SU	
PMLIL0U010	ERYTHRONIUM ALBIDUM	WHITE DOG'S TOOTH VIOLET	G5	S1	
PMLIL0U020	ERYTHRONIUM AMERICANUM	YELLOW DOG'S TOOTH VIOLET	G5	S1S2	
PMLIL0U0G0	ERYTHRONIUM ROSTRATUM	BEAKED DOG'S TOOTH VIOLET	G5	S1S2	
PMLIL150F0	HYMENOCALLIS LIRIOSOME	TEXAS SPIDER-LILY	G4?	S3S4	
PMLIL1A0F0	LILIUM MICHIGANENSE	MICHIGAN LILY	G5	S1S2	
PMLIL1A0P0	LILIUM SUPERBUM	TURK'S-CAP LILY	G5	S3S4	
PMLIL1F020	MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER	G5	S2S3	
PMLIL200B0	TRILLIUM FLEXIPES	DROOPING TRILLIUM	G5	S1	
PMLIL200C0	TRILLIUM FOETIDISSIMUM	FETID TRILLIUM	G3G4	S2S3	
PMLIL200H0	TRILLIUM LUDOVICIANUM	LOUISIANA TRILLIUM	G3G4	S2S3	
PMLIL200Q0	TRILLIUM PUSILLUM	DWARF TRILLIUM	G3	S1?	
** MARANTACEAE					
PMMAR03010	THALIA DEALBATA	POWDERY THALIA	G3G5	S1	
** ORCHIDACEAE					
PMORC03010	APLECTRUM HYEMALE	PUTTYROOT	G5	S1	
PMORC0C010	CALOPOGON BARBATUS	BEARDED GRASS-PINK	G5?	S2S3	
PMORC0G010	CLEISTES DIVARICATA	SPREADING POGONIA	G4	S2S3	
PMORC0Q0C0	CYPRIPEDIUM PUBESCENS	YELLOW LADY'S-SLIPPER	G5	S2S3	
PMORC0Q0F0	CYPRIPEDIUM KENTUCKIENSE	SOUTHERN LADY'S-SLIPPER	G3	SU	C2
PMORC10050	EPIDENDRUM CONOPSEUM	GREEN-FLY ORCHID	G3G4	S2	
PMORC16010	ORCHIS SPECTABILIS	SHOWY ORCHIS	G5	S1	
PMORC17020	GOODYERA PUBESCENS	DOWNY RATTLESNAKE-PLANTAIN	G5	S1	
PMORC1C040	HEXALECTRIS SPICATA	CRESTED CORALROOT	G3G4	S2	
PMORC1Y020	PLATANTHERA BLEPHARIGLOTTIS	LARGE WHITE FRINGED ORCHID	G4G5	S2	
PMORC1Y060	PLATANTHERA CRISTATA	CRESTED FRINGED ORCHID	G5	S3	
PMORC1Y0C0	PLATANTHERA INTEGRA	YELLOW FRINGELESS ORCHID	G3G4	S3S4	3C
PMORC1Y0D0	PLATANTHERA INTEGRILABIA	WHITE FRINGELESS ORCHID	G2	S1	C2
PMORC1Y0E0	PLATANTHERA LACERA	GREEN FRINGED-ORCHID	G5	S1S2	
PMORC1Y0L0	PLATANTHERA PERAMOENA	PURPLE FRINGELESS ORCHID	G5	S2S3	3C
PMORC1Z010	ERYTHRODES QUERCETICOLA	LOW ERYTHRODES	G3G5	S1S3	
PMORC27010	EULOPHIA ECRISTATA	SMOOTH-LIPPED EULOPHIA	G3G4	S1	C2
PMORC2B0G0	SPIRANTHES LONGILABRIS	GIANT SPIRAL LADIES'-TRESSES	G3	S2S3	
PMORC2B0K0	SPIRANTHES MAGNICAMPORUM	GREAT PLAINS LADIES'-TRESSES	G5	S2S3	
PMORC2B0P0	SPIRANTHES OVALIS	LESSER LADIES'-TRESSES	G5	S2S3	
PMORC2F050	TRIPHORA TRIANTHOPHORA	THREE BIRDS ORCHID	G4	S3	
** POACEAE					
PMPOA0C050	ANDROPOGON CAMPYLORACHEUS	A BLUESTEM	G4Q	SH	
PMPOA0C060	ANDROPOGON CAPILLIPES	A BLUESTEM	G4Q	S3	
PMPOA0C0C0	ANDROPOGON LONGIBERBIS	A BLUESTEM	G5	SU	
PMPOA0C0E0	ANDROPOGON PERANGUSTATUS	A BLUESTEM	G5	S3S4	
PMPOA0K110	ARISTIDA SIMPLICIFLORA	SOUTHERN THREE-AWNED GRASS	G2	S1	C2
PMPOA0K120	ARISTIDA SPICIFORMIS	PINE BARREN THREE-AWNED GRASS	G4	S1S2	
PMPOA2G020	ELYONURUS TRIPSACOIDES	PAN AMERICAN BALSAMSCALE	G5?	SU	
PMPOA2Y020	GLYCERIA ARKANSANA	ARKANSAS MANNA-GRASS	G5	S2S4	

PMPOA481P0	MUHLENBERGIA SYLVATICA	WOODLAND MUHLY	G5	SU	
PMPOA481Q0	MUHLENBERGIA TENUIFLORA	SLENDER MUHLY	G5	S2S3	
PMPOA4K2U0	PANICUM NUDICAULE	NAKED-STEMMED PANIC GRASS	G3?	S2	C2
PMPOA4P0Y0	PASPALUM MONOSTACHYUM	GULFDUNE PASPALUM	G4?	SU	
PMPOA5D0B0	ANDROPOGON STOLONIFER	A BLUESTEM	G3G4Q	S1S3	
PMPOA5D0D0	ANDROPOGON DIVERGENS	EASTERN LITTLE BLUESTEM	G5	SH	
PMPOA5L050	SETARIA CORRUGATA	COASTAL FOX-TAIL	G5?	SU	
PMPOA5Q060	SORGHASTRUM APALACHICOLENSE	OPEN INDIAN GRASS	G?	S1?	
** XYRIDACEAE					
PMXYR01070	XYRIS DRUMMONDII	DRUMMOND'S YELLOW-EYED GRASS	G3	S2	C2
PMXYR010A0	XYRIS FLABELLIFORMIS	FAN-SHAPED YELLOW-EYED GRASS	G4	SU	
PMXYR010H0	XYRIS SCABRIFOLIA	HARPER'S YELLOW-EYED GRASS	G2G3	S1	C2
** ZANNICHELLIACEAE					
PMZAN01010	CYMODOCEA FILIFORMIS	MANATEE-GRASS	G4	S1SH?	
PMZAN02010	HALODULE BEAUDETTEI	SHOAL GRASS	G5	S1?	

FERNS AND FERN ALLIES

** ADIANTACEAE					
PPADI03010	ADIANTUM CAPILLUS-VENERIS	SOUTHERN MAIDENHAIR-FERN	G5	S2	
PPADI09020	CHEILANTHES ALABAMENSIS	ALABAMA LIPFERN	G5	S1	
PPADI090F0	CHEILANTHES LANOSA	HAIRY LIPFERN	G5	S2	
PPADI0H020	PELLAEA ATROPURPUREA	PURPLE-STEM CLIFF-BRAKE	G5	S2	
** ASPLENIACEAE					
PPASP02100	ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT	G5	S1	
PPASP02170	ASPLENIUM RESILIENS	BLACK-STEM SPLEENWORT	G5	S1S3	
PPASP02180	ASPLENIUM RHIZOPHYLLUM	WALKING-FERN SPLEENWORT	G5	S1S2	
PPASP021K0	ASPLENIUM TRICHOMANES	MAIDENHAIR SPLEENWORT	G5	S1	
PPASP09010	ATHYRIUM THELYPTERIOIDES	SILVERY SPLEENWORT	G5	S1S3	
PPASP0B0B0	ATHYRIUM PYCNOCARPON	GLADE FERN	G5	S2S3	
PPASP0C0Y0	DRYOPTERIS X AUSTRALIS	SOUTHERN WOOD FERN	HYB	S1	
** EQUISETACEAE					
PPEQU01010	EQUISETUM ARVENSE	FIELD HORSETAIL	G5	S3?	
** HYMENOPHYLLACEAE					
PPHYM02040	TRICHOMANES BOSCHIANUM	BRISTLE-FERN	G4	S1	
PPHYM020G0	TRICHOMANES MEMBRANACEUM	SCALE-EDGE FILMY FERN	G3G5	SX	
PPHYM020K0	TRICHOMANES PETERSII	DWARF FILMY-FERN	G3	S1	
** ISOETACEAE					
PPIS001050	ISOETES ENGELMANNII	APPALACHIAN QUILLWORT	G4G5	S1S2	
** LYCOPODIACEAE					
PPLYC01070	LYCOPODIUM CERNUUM	NODDING CLUBMOSS	G5	S2S3	
** MARSILEACEAE					
PPMAR010A0	MARSILEA MUCRONATA	HAIRY WATER-FERN	G5Q	S1S2	
** OPHIOGLOSSACEAE					
PPOPH01010	BOTRYCHIUM ALABAMENSE	ALABAMA GRAPE-FERN	G3	S1S3	
PPOPH02090	OPHIOGLOSSUM PETIOLATUM	STALKED ADDERS-TONGUE	G5	S2S4	

Appendix J
Representative Species of Less Mobile Fish and Wildlife Expected to Occur in the Vicinity of Gulfport Field Training Site

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Sheet 1 of 8

Common Name	Scientific Name
Fish	
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*L. osseus*
Alligator Gar	*L. spatula*
Threadfin Shad	*Dorosoma petenense*
Bay Anchovy	*Anchoa mitchilli*
Chain Pickerel	*Esox niger*
Bigeye Chub	*Hybopsis amblops*
Coastal Shiner	*Notropis petersoni*
Blacktail Shiner	*N. venustus*
Blue Catfish	*Ictalurus furcatus*
Channel Catfish	*I. punctatus*
Diamond Killfish	*Adinia xenica*
Gulf Killfish	*Fundulus grandis*
Longnose Killfish	*F. similis*
Sheepshead Minnow	*Cyprinodon variegatus*
Mosquitofish	*Gambusia affinis*
Sailfin Molly	*Mollienesia latipinna*
White Crappie	*Pomoxis annularis*
Warmouth	*Chaenobryttus gulosus*
Longear Sunfish	*Lepomis megalotis*
Bluegill	*L. macrochirus*
Redear Sunfish	*L. microlophus*
Largemouth Bass	*Micropterus salmoides*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Sheet 2 of 8

Common Name	Scientific Name
Pinfish	*Lagodon rhomboides*
Striped Mullet	*Mugil cephalus*
Brook Silverside	*Labidesthes sicculus*
Tidewater Silverside	*Menidia beryllina*
Amphibians	
Lesser Siren	*Siren intermedia*
Central Newt	*Notophthalmus viridescens*
Gulf Coast Waterdog	*Necturus beyeri*
Spotted Salamander	*Ambystoma maculatum*
Marbled Salamander	*A. opacum*
Mole Salamander	*A. talpoideum*
Dusky Salamander	*Desmognathus fuscus*
Slimy Salamander	*Plethodon glutinosus*
Red Salamander	*Pseudotriton ruber*
Mud Salamander	*P. montanus*
Dwarf Salamander	*Eurycea guadridigitata*
Eastern Spadefoot	*Scaphiopus holbrooki*
Southern Toad	*Bufo terrestris*
Fowler's Toad	*B. woodhousei*
Oak Toad	*B. quercicus*
Pine Woods Treefrog	*Hyla femoralis*
Spring Peeper	*H. crucifer*
Gray Treefrog	*H. versicolor*
Squirrel Treefrog	*H. squirella*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Sheet 3 of 8

Common Name	Scientific Name
Green Treefrog	*H. cinerea*
Barking Treefrog	*H. gratiosa*
Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*
Cricket Frog	*Acris gryllus*
Strecker's Chorus Frog	*Pseudacris streckeri*
Southern Chorus Frog	*P. nigrita*
Southern Leopard Frog	*Rana pipiens*
Dusky Gopher Frog	*R. areolata*
Bronze Frog	*R. clamitans*
Bull Frog	*R. catesbeiana*
Pig Frog	*R. grylio*
Reptiles	
Snapping Turtle	*Chelydra serpentina*
Common Musk Turtle	*Sternotherus odoratus*
Mississippi Mud Turtle	*Kinosternon subrubrum*
Diamondback Terrapin	*Malaclemys terrapin*
Missouri Slider	*Pseudemys floridama*
Red-eared Turtle	*Trachemys scripta*
Gulf Coast Box Turtle	*Terrapene carolina*
Smooth Softshell	*Trionyx muticus*
Green Anole	*Anolis carolinensis*
Southern Fence Lizard	*Sceloporus undulatus*
Ground Skink	*Scincella lateralis*
Five-lined Skink	*Eumeces fasciatus*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Common Name	Scientific Name
Broad-headed Skink	*E. laticeps*
Six-lined Racerunner	*Cnemidophorus sexlineatus*
Slender Glass Lizard	*Ophisaurus attenuatus*
Eastern Glass Lizard	*O. ventralis*
Rough Earth Snake	*Virginia striatula*
Smooth Earth Snake	*V. valeriae*
Plain-bellied Water Snake	*Nerodia erythrogaster*
Diamond-backed Water Snake	*N. rhombifera*
Green Water Snake	*N. cyclopion*
Glossy Crayfish Snake	*Regina rigida*
Eastern Garter Snake	*Thamnophis sirtalis*
Western Mud Snake	*Farancia abacura*
Eastern Hognose Snake	*Heterodon platyrhinos*
Mississippi Ringneck Snake	*Diadophis punctatus*
Southern Black Racer	*Coluber constrictor*
Rough Green Snake	*Opheodrys aestivus*
Black Pine Snake	*Pituophis melanoleucus*
Gray Rat Snake	*Elaphe obsoleta*
Corn Snake	*E. guttata*
Scarlet Snake	*Cemophora coccinea*
Speckled Kingsnake	*Lampropeltis getulus*
Eastern Coral Snake	*Micrurus fulvius*
Southern Copperhead	*Agkistrodon contortrix*
Western Cottonmouth	*A. piscivorus*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Common Name	Scientific Name
Dusky Pigmy Rattlesnake	*Sistrurus miliarius*
Canebrake Rattlesnake	*Crotalus horridus*
Eastern Diamondback Rattlesnake	*C. adamanteus*
Birds	
Pied-billed Grebe	*Podilymbus podiceps*
American White Pelican	*Pelecanus erythrorhynchus*
Anhinga	*Anhinga anhinga*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Blue Heron	*Ardea herodias*
Great Egret	*Casmerodius albus*
Snowy Egret	*Egretta thula*
Little Blue Heron	*E. caerulea*
Tricolored heron	*E. tricolor*
Cattle Egret	*Bubulcus ibis*
Green-backed Heron	*Butorides striatus*
Yellow-crowned Night-Heron	*Nyctanassa violacea*
White Ibis	*Eudocimus albus*
Wood Duck	*Aix sponsa*
Mallard	*Anas platyrhynchus*
Mottled Duck	*A. fulvigula*
Gadwall	*A. strepera*
Blue-winged Teal	*A. discors*
Osprey	*Pandion haliaetus*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*B. jamaicensis*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Common Name	Scientific Name
American Kestrel	*Falco sparverius*
Northern Bobwhite	*Colinus virginianus*
Clapper Rail	*Rallus longirostris*
Virginia Rail	*R. limicola*
Purple Gallinule	*Porphyrula martinica*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*
Killdeer	*Charadrius vociferus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Laughing Gull	*Larus atricilla*
Forster's Tern	*Sterna forsteri*
Least Tern	*S. antillarum*
Gull-billed Tern	*S. nilotica*
Mourning Dove	*Zenaida macroura*
Northern Flicker	*Colaptes auratus*
Tree Swallow	*Tachycineta bicolor*
Barn Swallow	*Hirundo rustica*
Blue Jay	*Cyanocitta cristata*
American Robin	*Turdus migratorius*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
Loggerhead Shrike	*Lanius ludovicianus*
Rufous-sided Towhee	*Pipilo erthrophthalmus*
Savannah Sparrow	*Passerculus sandwichensis*
Red-winged Blackbird	*Agelaius phoeniceus*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Common Name	Scientific Name
Red-winged Blackbird	*Agelaius phoeniceus*
Eastern Meadowlark	*Sturnella magna*
Mammals	
Virginia Opossum	*Didelphis virginiana*
Nine-banded Armadillo	*Dasypus novemcinctus*
Eastern Mole	*Scalopus aquaticus*
Northern Short-tailed Shrew	*Blarina brevicauda*
Least Shrew	*Cryptotis parva*
Big Brown Bat	*Eptesicus fuscus*
Red Bat	*Lasiurus borealis*
Seminole Bat	*L. seminolus*
Evening Bat	*Nycticeus humeralis*
Rafinesque's Big-eared Bat	*Plecotus rafinesquii*
Brazilian Free-tailed Bat	*Tadarida brasiliensis*
Gray Fox	*Urocyon cinereoargenteus*
Red Fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*
Striped Skunk	*Mephitis mephitis*
Spotted Skunk	*Spilogale putorius*
Gray Squirrel	*Sciurus carolinensis*
Fox Squirrel	*S. niger*
Southern Flying Squirrel	*Glaucomys volans*
Nutria	*Myocastor coypus*
Marsh Rice Rat	*Oryzomys palustris*
Eastern Harvest Mouse	*Reithrodontomys humilis*

Appendix J
Representative Species
of Less Mobile Fish and Wildlife

Common Name	Scientific Name
White-footed Mouse	*Peromyscus leucopus*
Cotton Mouse	*P. gossypinus*
Golden Mouse	*Ochrotomys nuttalli*
Eastern Woodrat	*Neotoma floridana*
Hispid Cotton Rat	*Sigmodon hispidus*
Muskrat	*Ondatra zibethicus*
Black Rat	*Rattus rattus*
House Mouse	*Mus musculus*
Swamp Rabbit	*Sylvilagus aquaticus*
Eastern Cottontail	*S. floridanus*

Sources: Banks, et al. (1987); Christmas (1973); Conant (1958); Cooke (1959); National Geographic Society (1987); U.S. Fish and Wildlife Service (1984); and Wolfe (1971).

Note: Although 200 or more species of birds may occur near the site seasonally, the species listed here include the semi-aquatic and terrestrial species that may have the greatest potential exposure.